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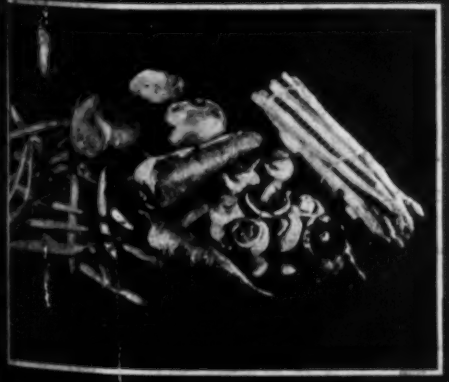

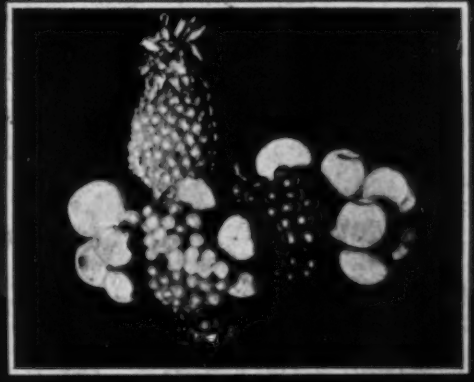

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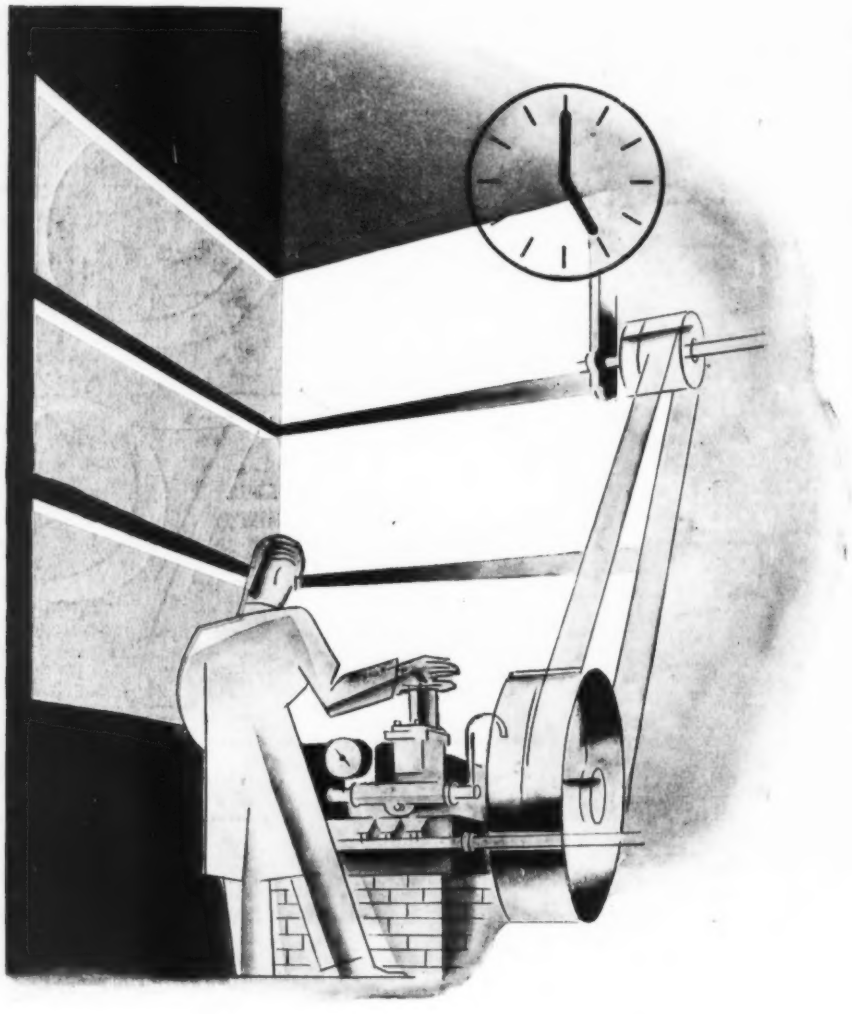

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FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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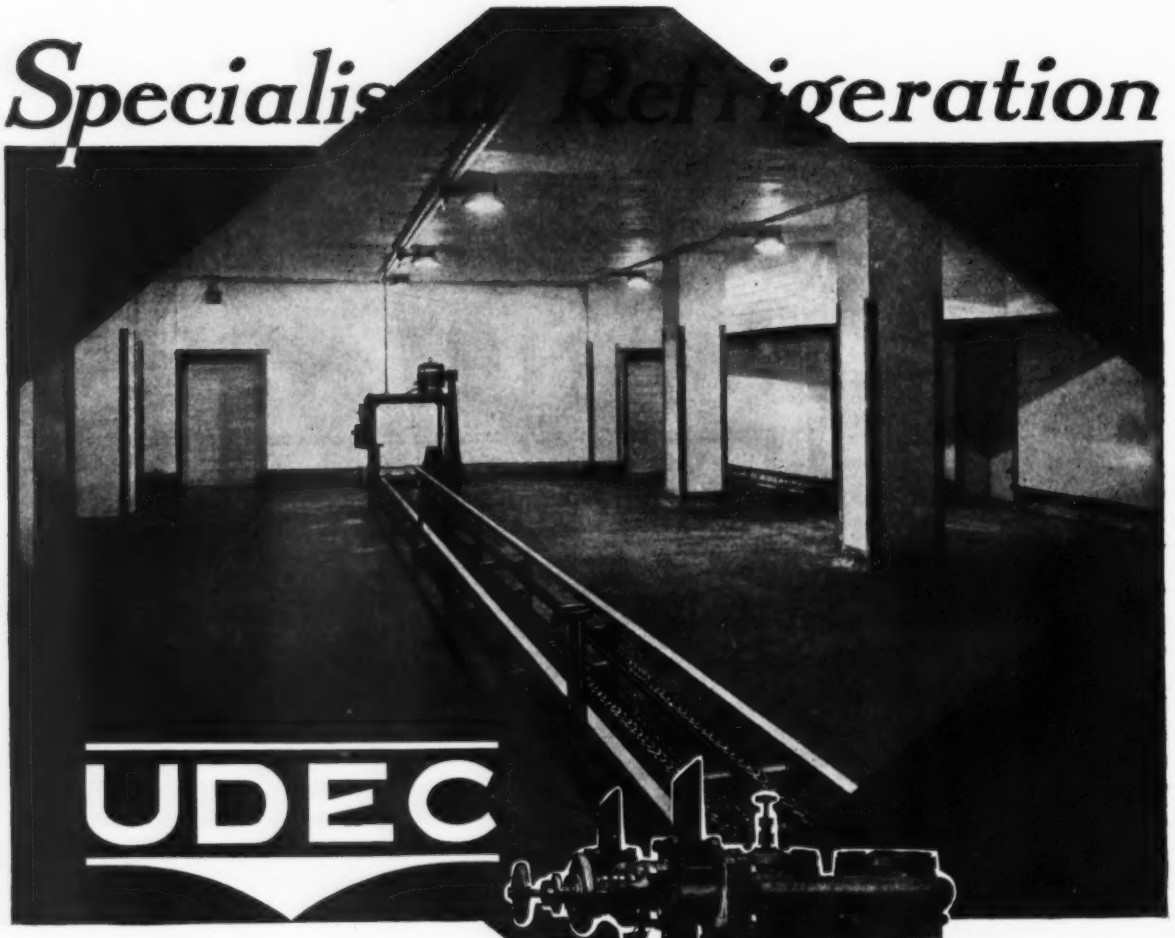

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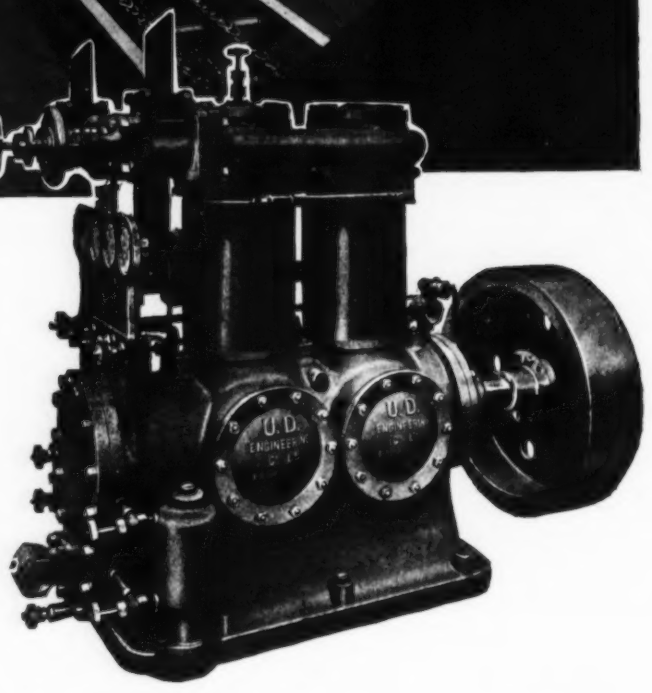

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FOOD MANUFACTURE

Vol. XIII, No. 11 November, 1938

Is it Peace?

WE HAVE emerged from a great ordeal, and having trembled on the brink of a huge catastrophe are now asking ourselves if it is really all over and whether we shall have peace for our generation. For over two years we have unceasingly preached the gospel of food storage. We have always spoken of the spectre of war looming ahead of us and we have used every effort to stimulate interest and action in the matter of food supplies for an emergency. When the testing time came our hearts misgave us and doubts about the adequacy of our stocks which had seemed ominous enough before now became positive nightmares in the face of the actual reality of war.

We had been informed that an excellent distributive system had been evolved and that a compulsory rationing scheme was ready to be put into operation. The country had been divided into groups and food officials had been appointed. Bread and meat rationing cards were in readiness. Sir Thomas Inskip and Sir Henry French had made speeches about how well we were prepared and the arrangements for co-operation with the food-producing industry.

All these things to reassure us, and yet our hearts misgave us because we felt that the food was not in the country to distribute. The stabilising of certain prices prevented any panic and there was not excessive hoarding. The trouble would have come later. Whatever else may come of that awful scare, it certainly should make us redouble our efforts for the accumulation of stocks of essential foods actually in this country.

We are told that we shall have no war with Germany now, but the next war might not be with Germany—wherever it comes from we must be prepared and have a substantial reserve of food.

The People's Food

Sir William Crawford has certainly given us plenty of food for thought in an extraordinarily interesting book entitled *The People's Food*. Statistics are notoriously misleading and many entirely erroneous views have been arrived at from time to time by drawing hasty conclusions from inadequate data. In the present case, however, the survey appears to be quite adequate, and the conclusions drawn are the result of 5,000 personal interviews in London, Birmingham, Leeds, Glasgow, Newcastle, Liverpool and Cardiff. There are five classes of people according to income, the highest class having over £1,000 per annum and the lowest under £125. Of the 5,000 interviews, 4,000 were devoted to incomes of less than £500—so that the data obtained is in fairly accurate proportion to the distribution of the population.

Everyone connected with the food industries realises the part played by food in the health and prosperity of the nation, but this book lays bare many disturbing features of which we may not have known before. Present deficiencies are the measure of future demands and, in order to determine these, the author has compared the standards of consumption as shown by his survey with the recommended minimum diets laid down by various authorities.

In the past century the community has deemed it expedient to provide education, housing and medical services at prices below their cost of production. The tendency to-day seems to be to apply this principle to nutrition. Already milk is being supplied to children at reduced prices. With the rise in the standard of living a new market is being created for the food manufacturer. The discerning producer will find in this book the general trend of food requirements, the wise one will draw his own conclusions and frame his business accordingly.

Sugar

The beet-sugar industry is a point of interest in the Report of the Sugar Commission for the year ended March 31, 1938, noted briefly in our last issue. Of the acreage provisionally allocated to English factories only 85 per cent. were contracted for, and of the 15,000 acres allotted to the Cupar factory only just over half was taken up. Reference was made in the Commission's first Report to the difficulties experienced by beet growers in obtaining a sufficient number of casual workers for

the seasonal cultivations and also to the increase in the cost of available labour. The lower acreage in 1937 eased these difficulties, but, in some areas, the crop suffered through a shortage of labour at the critical times, and the labour problem still affects the response to the beet contracts.

The Report shows that the Commission's estimate of the maximum quota income for 1937-38 of £1,005,632 was too high. It was based on the estimate of a tonnage of refined sugar to be invoiced for sale amounting to 1,930,000 tons. The figures were adjusted, but even so the figure was still too high and the further adjustment of the rate of assistance will involve a payment from the Exchequer to the Corporation. This was the first year in which the business of calculating a rate of assistance in accordance with the provisions of the Act had to be undertaken. Obviously it is a complicated business and as time goes on modifications will be developed.

One point laid down by the Act is that the calculations for the year are to be made on the assumption that the standard quantity of sugar (defined in the Act as equal to 560,000 tons of white sugar) will be produced. This seems a rather absurd system in any particular season when the acreage contracted for indicates that such a quantity will not be produced. Undoubtedly amendments to the Act are needed, but it is very difficult to get an Act revised once it is in the Statute Book.

American Experience

Apropos fruit freezing we may do worse than study carefully the methods used in America. On September 5, 1938, a correspondent to *The Times* gave a very full account of how the American industry of freezing fruit and vegetables has been built up along scientific lines. At present in Great Britain the freezing of fruits and vegetables is on a small scale, but there are signs of development on much broader lines. In the large American cities practically every kind of fruit and vegetable can be obtained fresh at all times of the year, but, in spite of this, the trade in frozen products is established and rapidly expanding, and, at present, about 160 million lb. are consumed annually.

This industry is being built up scientifically. In the Government and State laboratories, and in the universities, research often financed by the industry is carried out on many biological aspects, such as the correct heat treatment in blanching of vegetables before freezing to prevent subsequent undesirable enzymic action. The effect of different rates of freezing on texture and flavour is important, as is also the optimum temperatures for storage, the behaviour of bacteria and the effect of variety and degree of maturity on the quality of the frozen product. As an example of the influence of variety, of the 105 varieties of peas grown only two are considered good enough for packing.

We referred last month to the enzyme problems confronting the quick freezers of vegetables and the importance of proper blanching treatment. Many of these problems have been solved in America, but we do not wish to give the impression that nothing has been done here. One example is the enterprise of the Liverpool Refrigeration and Engineering Company in the development, at considerable expense, of what is known as the "Z" process of quick freezing. This has been applied successfully to fish on a commercial scale, and work on ducks, poultry, rabbits, fruits and vegetables is promising.

Cheese Standards

The recent prosecution at Mitcham of a cheese manufacturing firm raises interesting points. The action concerned a packet of carton cheese described as "Finest Cheddar Cheese". The Buckinghamshire County Council stated that the cheese was not a full milk cheese with a fat content of 45 per cent., and, therefore, could not be described as Cheddar cheese. The defence was that there was no legal standard for Cheddar cheese. This started the usual arguments.

The public analyst stated that the fat content was 36·3 per cent., and alleged that he had never before come across a Cheddar cheese which had a fat content of less than 45 per cent., and he put the average at 48 per cent. When pressed by the defence, however, he agreed that there was no legal standard for cheese, but that he based his standards on the standard of the Association of Public Analysts and on ten years' experience. That may be so; but is it enough? Surely these matters could be put in a perfectly sound position by legalising and enforcing certain standards which are now accepted by competent authorities. In the case of cheese the standard for Cheddar cheese accepted by the Ministry of Agriculture for the National Mark Scheme is not less than 45 per cent. fat content.

In our opinion, in the absence of any legal standard, the prosecution should have failed as evidence was given that there were just as many three-quarter Cheddars as full creams, and that the finest quality Cheddar was not necessarily full cream Cheddar. In spite of this the case was found proved and the defendants fined. The position is very un-

satisfactory, and until legal standards are laid down and enforced all sorts of anomalies will exist.

Night Blindness and Vitamin A

A research conducted by Drs. George Wald and Harold Jeghers and Joseph Arminio at Harvard University, in co-operation with the Boston University School of Medicine and the Boston City (Massachusetts) Hospital, into the causes of night blindness was reported in a recent issue of the *American Journal of Physiology*.

Dr. Wald has shown in previously published work that the substance known as visual purple of the eye is formed directly from vitamin A and that the first process of seeing is the bleaching action of light on this substance. In the present research, experiments were carried out on a subject with normally perfect vision. In order that his eyes might assume the best possible condition for the tests, he was fed a balanced diet supplemented by daily doses of vitamin A, and his threshold of vision —the least amount of light that can be glimpsed in a darkened room—determined. At the end of a six-weeks' control period under these conditions, the diet of the subject had the usual sources of vitamin A—coloured vegetables, milk and egg products—eliminated. As shortly as twenty-four hours after the introduction of the restricted diet, effects on the vision of the subject were noticeable, and after twenty-five days his threshold of vision had diminished to one-fiftieth that of normal.

The Cure

Almost unbelievably rapid was the effect of the cure of the condition, begun first by feeding the subject standard halibut liver oil capsules equivalent to 100,000 vitamin A units. Improvement of vision was observed in thirty minutes and within a further two hours normality of vision was restored. A further reduction of the time required to cure the disease was obtained by feeding capsules of carotene, while one experiment resulted in a complete cure in twenty minutes when, to eliminate the delay of the time required for digestion following administration *per os*, carotene was injected into the muscles of the subject.

Dietary night blindness due to a deficiency of vitamin A, therefore, can be avoided by the simple inclusion of the everyday diet of a reasonable amount of vegetables with an adequate vitamin A content and milk and egg-containing foodstuffs.

The Declining Consumption of Bread

During the last twenty-five years the consumption of wheat has tended to fall in all wheat-eating countries owing to the fact that less bread is being consumed. In U.S.A. it has dropped by 31 per cent. since 1899, France shows a decline of 12 per cent. and Great Britain one of 11 per cent. Despite a strenuous advertising campaign by the Millers Mutual Association the loss has not been recovered, although the decline has been stemmed. Probably the reason for this decline in wheat and bread consumption is the paradoxical one that cereals are about the least expensive of all the energy-giving foods.

Bread is certainly the cheapest source of the calories required by man. But with a rise in the standard of living other, and more expensive, foods are preferred as soon as they can be afforded. The "pop" and cockles of poverty become the champagne and oysters of wealth.

Social imitativeness tends to extend to the poorer classes new foodstuffs devised or adopted higher in the social scale. Fancy breakfast cereals appear on many poorer class tables to-day, and this reduces the demand for bread.

Another factor frequently overlooked is that the average human being requires less calories than he used to. Increasing mechanisation of industry relieves the human frame of many of its more strenuous tasks and the workers to-day require less energy than they did in the Victorian era. The extending use of the motor-car is another energy-reducing factor. Sedentary workers used at any rate to walk to the station, now their perambulation in many cases ends at the garage. Finally, the increased use of another source of energy—sugar—has had its effect in bread consumption. Bread is still the staff of life, but it is getting a little worn down at the ferrule.

Wheat

At this season of rejoicing at the successful ingathering of the harvest it is fitting to take stock of the situation in regard to the chief cereal crop. All too frequently in the past Nature's munificence has been an embarrassment to the farmers, and there is every indication that this is going to happen this year. No figures have yet been published for this year's total world crop, but the preliminary estimates indicate that this year's wheat crop will be about 10 per cent. above last year's yield. Prices are so peculiarly sensitive to supply that a variation of about 10 per cent. in the world harvest appears to cause a doubling or halving of prices in the market. The chief influences on market conditions this year are undoubtedly the big harvests in U.S.A. and Canada. During the crop years 1935-36

and 1936-37 poor harvests compelled the U.S.A. to import large quantities of wheat, but last year she imported one hundred million bushels, and this year Government is prepared to subsidise exports to the extent of one hundred million bushels.

The yield in Canada is about double that of last year. *The Monthly Review of the Wheat Situation* published by the Canadian Ministry of Trade and Commerce gives estimates for the leading countries for the past four years. The chief importing countries in Europe have increased their output by twenty-two million bushels, while the exporting countries in Europe have increased their output by sixty million bushels. The yield for this country is just nine million bushels more than last year.

The estimated world total is 4,227 million bushels excluding the crops in U.S.S.R. and China, and is no less than 401 million bushels more than last year. This is the largest crop on record, and a collapse of prices is not surprising. Only in the unlikely event of a crop failure in the Argentine and Australia would the situation be eased. The crop in U.S.S.R. is said to be satisfactory. Unlike the producers of other basic raw materials, wheat producers have not yet been able to organise a marketing scheme to suit everyone, no doubt because of the uncertainty of crop yields and the scattered sources of production, but the present situation provides a valuable incentive.

The Trade Cycle

The driving force behind the recovery of 1933-37 is still a matter of controversy, but it is now fairly clear that it was not any particular factor, but rather a combination of several. It is not a difficult matter to discredit those who maintain that tariffs, or going off the gold standard, or cheap money was the chief cause of the recovery, though it is evident that each of these factors played an important rôle.

The Economist claims that our rapid rise from the depths of the depression was largely, though not exclusively, due to the fact that, "wage and salary earners . . . after buying their food, drink and tobacco and clothes, had something like £250 million a year more left over in 1932 than in 1924-27." As industrial activity increased, and more people were employed, this surplus left after providing for the necessities of life increased as the recovery gathered momentum. However, as these necessities rose in price the recovery lost way.

There is little doubt but that the present abundance of wheat will assure consumers in this country of at least one item on their budget that will not show any marked rise in price, and will be an influence in modifying the severity of the present recession. It can be fairly conclusively established that prosperity is sustained in this country by cheap food.

Where's that Bust?

The lobster mayonnaise and *chianti* had been good. We found ourselves in a room with four strange-looking figures who were standing at a table covered with tins and glasses. A stoutish, clean-shaven man, interestedly handling some glasses of preserved tongue, was gesticulating animatedly with his three companions and pointing to the metal top. Diffident—we approached the little group. The stout man exclaimed, "The top—why, oh why, did I not think of it? *Moi qui parle*—Nicolas Appert".

We jumped. Nicolas Appert? But what? How? The mystery was solved when we realised that we were able to see the two buttons on the back of the gentleman's coat, just as Scrooge saw Marley's. There was no mistaking two of his companions—inexplicably we accepted the fact of the presence of Napoleon Bonaparte and Louis Pasteur. The other we did not recognise, but his identity was established by the conversation—they called him Durand. We were disconcerted by the eagle gaze of Napoleon. "I killed a lot of people—Nicolas fed them. You use his work. Do you honour him? Where is his statue or bust in London?" We thought rapidly and suggested looking in the headquarters of the National Canning Council at Whitehall. Somehow we found ourselves wandering through the rooms. The lambent glow emanating from our companions failed to bring to light that which was sought. Appert groaned. "In Chicago . . ." he murmured. And was silent. Napoleon seemed to dismiss us as a poor specimen of perfidious and ungrateful Albion, and that was all there was to it.

Durand then spoke. "And the tins?" he asked. "Ah," we said hopefully, "let's go to Kingsway". "I'm sure the Metal Box has . . ." We were suddenly transported. After the fruitless search we had to suffer the reproachful but less angry gaze of the inventor of the food can. The three looked towards Pasteur, who was watching some bubbles in a bottle of fruit, watching them mounting upwards as he turned the bottle. "Yes, my friends, I have been honoured. But . . . what is all this I hear about pasteurised milk?"

A mist seemed to pass before our eyes, and when it had cleared the four figures had vanished.

MILK

flows in a great stream from the 2,000 farms in the peaceful countryside of Somerset to APLIN AND BARRETT'S throbbing factory plants at Frome, Yeovil, Wellington, Westbury, Sparkford, Crewkerne and Keinton, where milk undergoes metamorphosis into a score of diversified foods. How this is done is told by

T. CROSBIE-WALSH, F.I.C.

THE FROME factory lies tucked away in the valley distant a mile or so from the busy little market town perched on the side of a steep hill. The new red brick and Bath stone building contrasts not unpleasantly with the surrounding green, and its reflection may be seen in the waters of the mill stream (once used as a source of power for a cloth factory on the same site) which flows alongside.

Over two hundred and fifty farms send their milk to Frome. Owing to the fact that milk produced under unsanitary conditions is liable to excessive bacterial contamination, producing acidity and other defects which may play havoc with the products at some stage in their elaboration, a large staff of experienced farm inspectors supervise the methods of production at the source. This is the first stage of the control which does not cease until the products leave the factory.

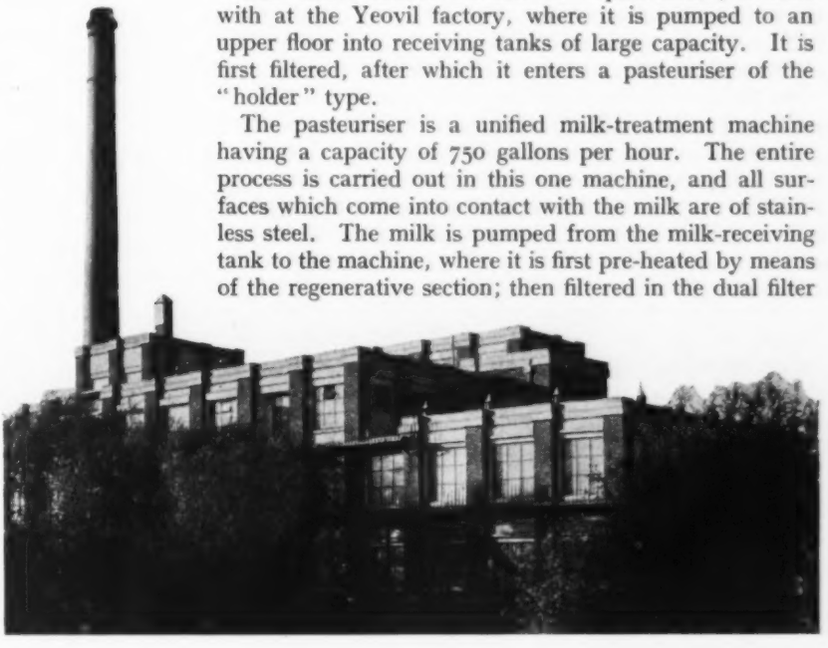
A stern periodical testing awaits each individual farmer's milk on its arrival. Here, the first hurdle to be negotiated is the verdict of the expert judges on the churn platform, whose noses and palates are trained to detect the slightest traces of "off-flavour", and who determine whether the milk has been properly cooled at the farm. Next, the laboratory takes a hand. Acidity, methylene blue and other tests are made. Should the quality fall below the strict standards imposed, the farmer's methods are overhauled, the trouble diagnosed and the necessary remedies applied.

The milk, with its clean bill of health, is now weighed and distributed to the different parts of the factory by pumping. The empty churns are not neglected—they are immediately cleansed in an automatic washer (most things are done automatically), and the degree of cleanliness checked by bacteriological tests.

Whole Milk

The milk, destined for sale as "liquid milk", is dealt with at the Yeovil factory, where it is pumped to an upper floor into receiving tanks of large capacity. It is first filtered, after which it enters a pasteuriser of the "holder" type.

The pasteuriser is a unified milk-treatment machine having a capacity of 750 gallons per hour. The entire process is carried out in this one machine, and all surfaces which come into contact with the milk are of stainless steel. The milk is pumped from the milk-receiving tank to the machine, where it is first pre-heated by means of the regenerative section; then filtered in the dual filter



FROME. Flanked either side with foliage, the chimney stack alone proclaims this pleasant building as a factory. Within this placid exterior there is the whirr of intense industry, men and machines bending their efforts towards the transformation of raw milk into the many products shown on the graph following.

and afterwards heated to 145° F. in the main heater; from there it flows into the holding tank. After the milk has been held for half an hour it flows by gravity from the holding tank over the outside of the regenerative section, and then over the milk coolers proper, and from thence into the cold milk balance tank. The temperature is maintained to within plus or minus half a degree by means of automatic control. Cleaning is carried out at floor level, and the very high finish given to all the parts makes this important operation particularly easy. The milk coolers are enclosed but permit of aeration of the milk as it flows from the coolers. For a complete pasteurisation plant of this capacity it occupies the minimum floor space. It is worthy of note that the final cooling of the milk is done by means of the chill-water system, which further permits of extremely economical use of the refrigerating plant, which must necessarily reduce costs.

Skim Milk

Being a by-product of cream and butter production, the subsequent treatment of skim milk not only solves the problem of the disposal of large quantities of bulky material but leads to the obtainment of powdered milk, the valuable and stable product used in bakery and other trades.

The spray drying system is used by Aplin and Barrett for the preparation of this product. The principle of this system consists of the pre-condensation of the dilute skim milk, followed by its reduction to an exceedingly fine spray or mist in the presence of currents of dry, heated and filtered air. The milk is so finely divided that it presents an enormously large evaporating surface whereby moisture is readily absorbed by the hot air, and the dry particles fall to the bottom of the hot-air chamber in the form of powder.

Pre-Condensation

The plant used for pre-condensation is a patent triple circulation high vacuum film evaporator. This evaporator embodies the features of the well-known climbing film principle specially adapted for the treatment of such liquors as milk. In this design the tubes in the calandria are divided into three sections, the ratio of heating surface in each being carefully proportioned. Associated with each section is a tangential type separator in which the liquor is separated from the vapour at each stage of the concentration. The whole plant operates under vacuum, there being a continuous feed of weak liquor to the first section and a continuous output of concentrated liquor at the required density from the third section. The liquor is drawn into the evaporator by virtue of the vacuum, passes through the three sections in series and is finally discharged under barometric head. Each section operates under full vacuum, so that the full lowering in temperature due to the vacuum is maintained in the liquor throughout the plant. The vacuum is maintained by means of a barometric condenser and air ejector, the latter being operated by high-pressure steam.

The cleaning of both the evaporator and the separator is a very important item, and is done by a tube brush driven by a flexible drive from an electric motor. All parts coming into contact with milk are made of stainless steel. The evaporator has a capacity of handling 500 to 600 gallons per hour of skim milk, which is concentrated to anything up to 50 per cent. total solids.

The Spray Dryer

This consists of a large chamber, cylindrical at the top and cone-shaped at the bottom. In the system used, the air current for drying enters at the top of the chamber and passes downwards through the atomised milk. The atomiser is of the disc centrifugal type. The disc is bell-shaped and the milk is fed from above to the underside of the disc, where it spreads evenly around the periphery and escapes from the edge in the form of a film of definite thickness. The temperature of the air inlet is 155° C., while towards the bottom of the chamber it drops to 92°, but the temperature of the milk during the process does not exceed 42° C. The sprayed milk travels down the drying chamber as a spiral current. About 96 per cent. of the powder is obtained from the base of the cone. The air is extracted from a central vortex in order to carry away as little powder as possible. The powder carried away is mainly recovered in a cyclone separator, similar in shape to the main dryer but smaller, and final traces of powder (not over 1 per cent. of the whole output) are removed by means of filtered bags.

Heat is transferred from the main boiler fires to an apparatus which in turn delivers the hot filtered air to the drying plant, and this can be supplemented by a steam heater.

The flue gases from the boiler house provide the source of heat for the hot-air blast, although there is also a steam heater in the same circuit.

The milk powder is discharged at the bottom of the chamber and has a fine floury grain and requires no grinding. After bolting and sifting it is ready to be packed in bulk or in the smaller consumer packages.

The dried milk is packed into containers of various types: kegs, which are coated on the inside with an impervious preparation and lined with a suitable paper lining, and rectangular tins. The air in the packages is replaced by nitrogen gas, to avoid oxidation.

Spray drying is a notable improvement on the previously used systems, such as drum drying, etc., and results in a product which is practically 100 per cent. soluble in water. This solubility is of special value in the case of full cream milk powder, which is prepared by the same process.

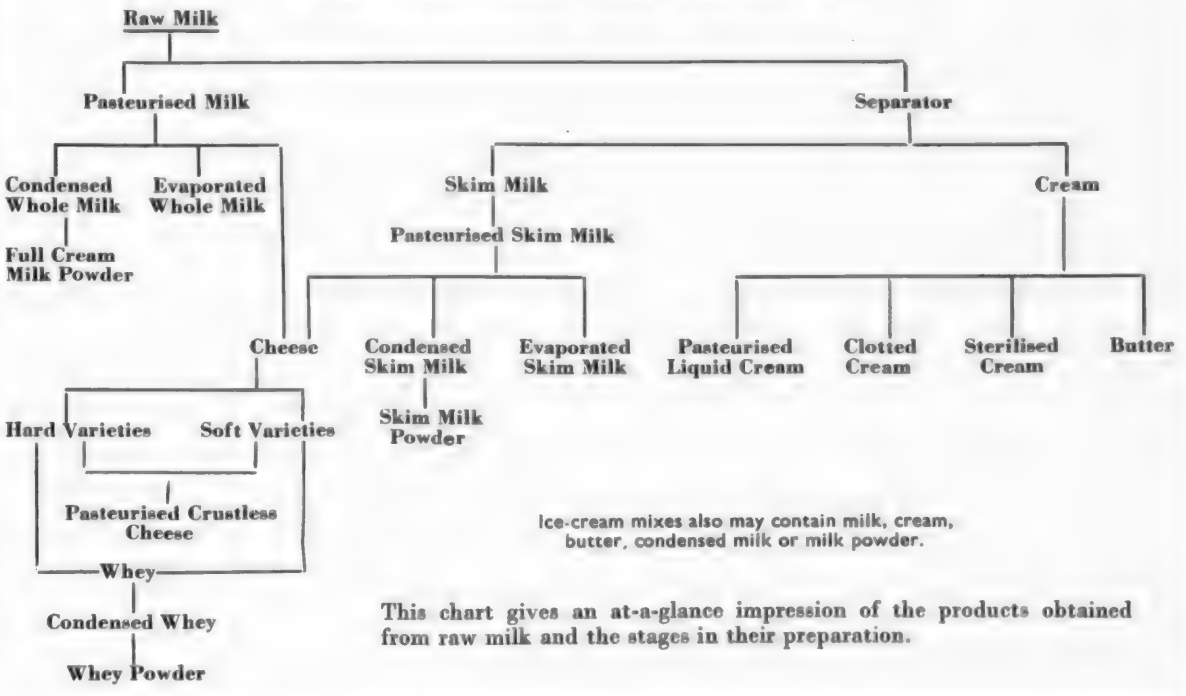
Skim Milk Cheese

This is still another product made from skim milk, and the description of the process figures under "Soft Cheese".

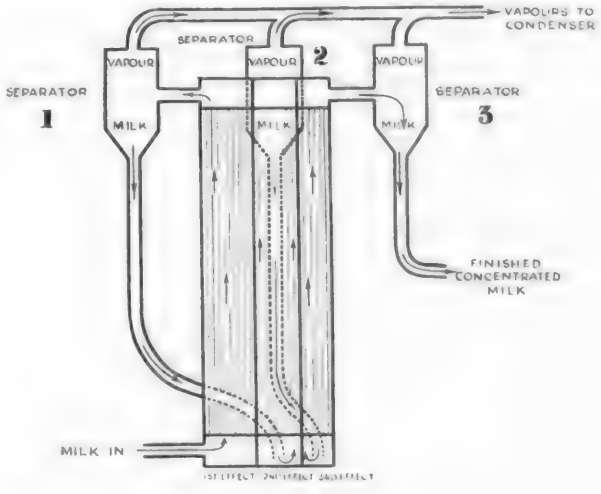
Skim Condensed Milk

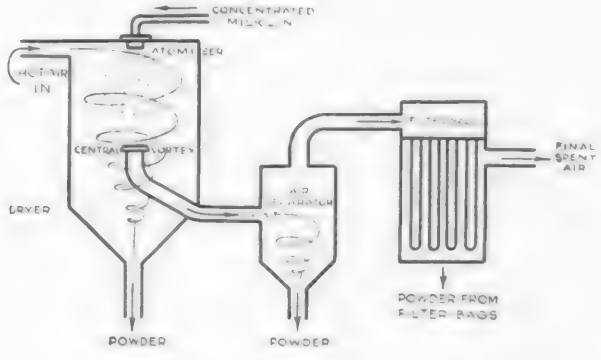
Another outlet for skim milk is the condensed product, and for this purpose are used single effect evaporating pans, forced circulation evaporators double effect, and climbing film evaporators triple effect.

MANUFACTURED MILK PRODUCTS



This chart gives an at-a-glance impression of the products obtained from raw milk and the stages in their preparation.





Diagrammatic sketches showing, on the left the Kestner evaporator for pre-condensation of milk, and below the spray dryer. (*Not to scale.*)

Cream

The cream from the separators is sent out either as bulk liquid cream or bottled or tinned sterilised cream.

Much research work has been performed, both bacteriological and physical, in connection with the preparation of cream in its different forms.

A special "flash" pasteurisation method is adopted, and after homogenisation the product is rapidly filled by means of automatic fillers into bottles and tins.

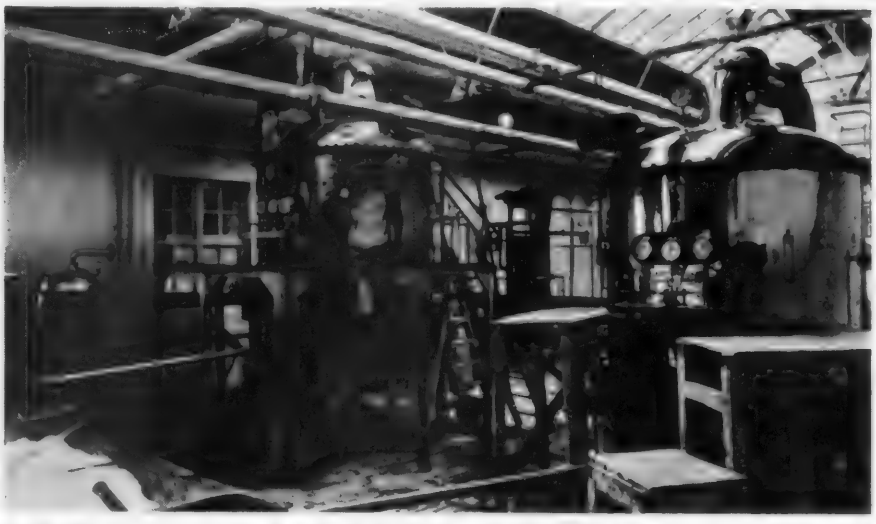
It is a feature of the work that the empty tins and bottles are sterilised prior to filling, despite the fact that the product is to be subsequently sterilised.

The bottles are capped by automatic sealing machines, and the tins by the usual double-seamers, after which they are sterilised and cooled under automatic control.

Such is the attention paid to the quality of this product that in addition to chemical and bacteriological examination every tin and bottle of cream produced is incubated in a special chamber for 10 days. This procedure ensures that no tin or bottle of cream which is not sterile leaves the factory.

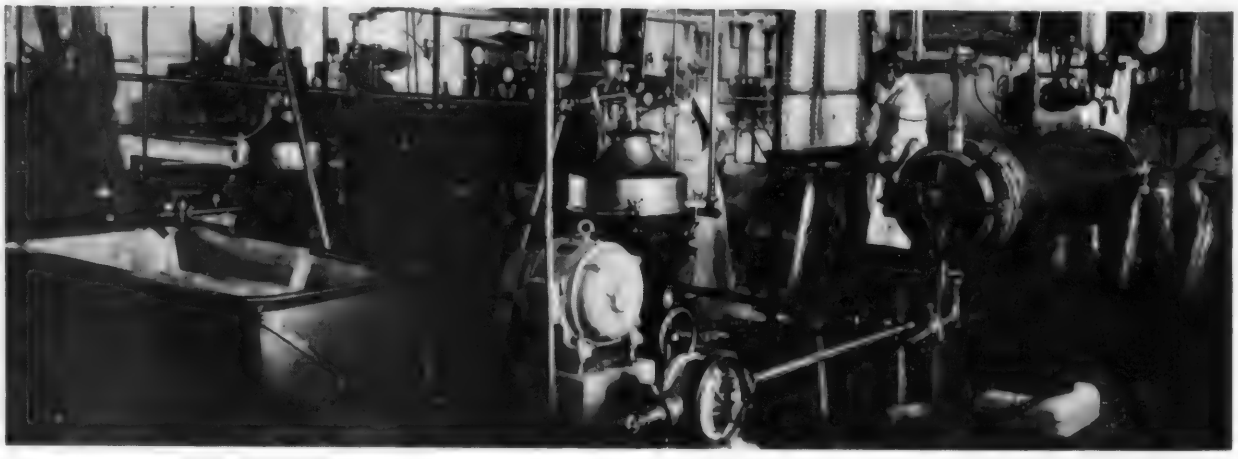
Automatic labelling and packing conclude a process over which no pains are spared to ensure perfect safety and quality for the consumer.

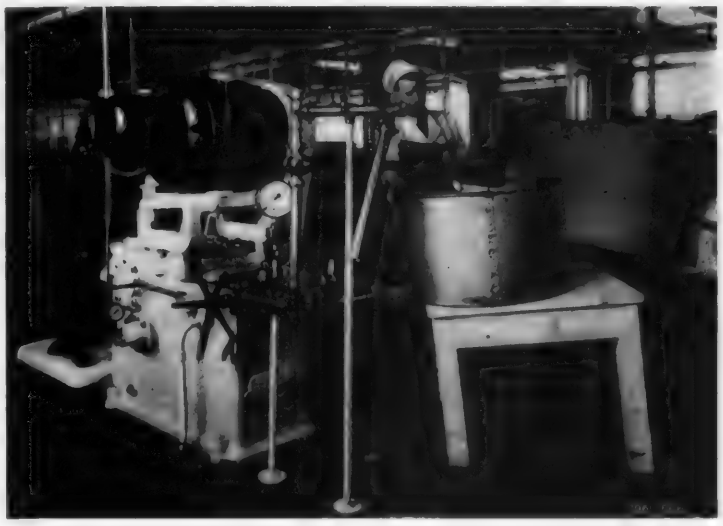
After being filtered, the milk destined to be sold as "Liquid Milk" enters this Graham Enoch pasteuriser of the "holder" type above. The pasteurised milk is then filled into bottles. To the right is shown the top of the Kestner drying chamber. The evaporated milk is seen passing to the atomiser in the centre. The atomiser revolution indicator is near the electric motor, the instrument board is left.



On the left are shown two condensed milk vacuum pans. The left is by Worssam and the right by Braithwaite.

One type of powdered milk is made from skim milk. Below is shown the Alfa-Laval foamless separators and the two Scott tubular flash pasteurisers.





On the left is shown the 300 g.p.h. Brush patent valve homogeniser installation erected in 1936, used in the production of sterilised cream. All parts of this machine that contact the product are stainless steel. The cylinder head is machined from a solid stainless steel forging.

Every tin and bottle is sterilised before being filled with cream; subsequently the pack is incubated in a special chamber for 10 days. Only after this is the cream sold. The picture below shows an Albro filler at work on bottled cream.

Before any goods can leave the factory a certificate must be obtained from the laboratory, where all finished products are subjected to chemical and bacteriological tests. The bottom picture shows a part of the Yeovil chemical and bacteriological laboratory.

Ice-cream

A liquid "mix" for ice-cream is another interesting product made at Frome. This consists of cream, milk, stabiliser, etc., which is ready to be frozen. It is packed in conveniently sized tins and is a standardised article.

Another step in providing the vendors of ice-cream with a reliable and labour-saving article is the preparation of a complete dry mixture which requires only the addition of water to prepare a high quality ice-cream. This is a stable product which may be kept for a considerable period.

Custard Powder

Quite a new departure is the manufacture of "St. Ivel" Full Cream Milk custard powder, which requires only the addition of water and sugar to produce a custard. It is made of full cream milk, and is offered in small containers as well as in bulk for the larger packings.

Sweetened Condensed Milk

This is a condensed milk, one part of which corresponds to 2½ to 2¾ parts of fresh milk.

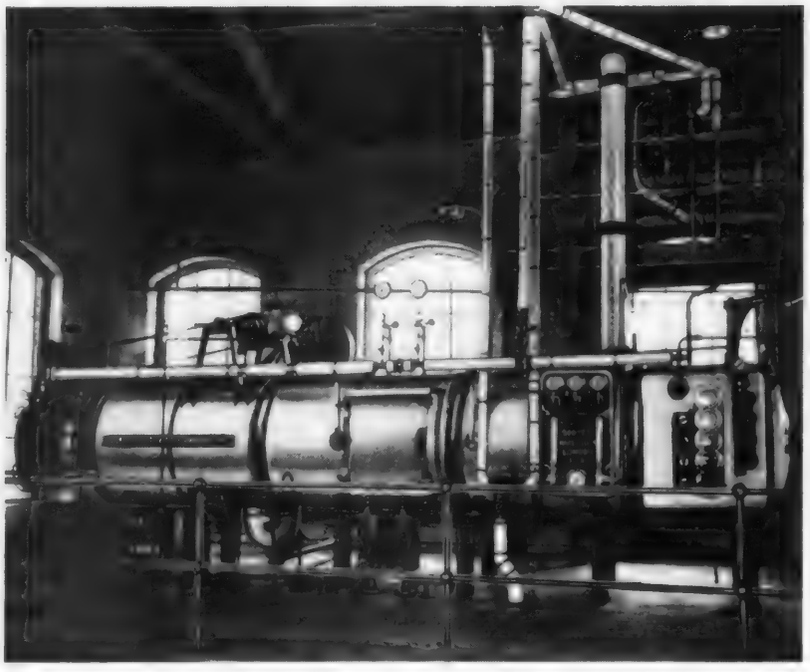
From the pasteurisers the milk is passed over a cooler into holding tanks. It is in these tanks that the milk is standardised as to fat and solids-not-fat content and the requisite amount of sugar added.

It then passes to the vacuum pan of the batch type, where evaporation takes place.

The standardised condensed milk runs by gravity through coolers, and from these it is discharged into crystallisation tanks, and thence into the filling machine and into tins, which are then sealed. It is also packed in barrels for bulk users.

Considerable scientific control is exercised all through this operation. In addition to the control of raw milk and pre-heating a close watch is kept upon the sugar used, as this may well be a source of bacterial contamination. Each batch of sugar is subjected to a rigid bacteriological examination.

There are sundry operating difficulties inseparable from evaporation. The main one is the prevention of excessive frothing, which results in the accumulation of milk in



Material to be dried is fed into this Scott patent vacuum band dryer in a continuous fashion on to a number of slowly moving specially woven wire bands. It is discharged from each band in the form of a cake, which is broken up and dropped into hoppers and discharged periodically from the machine. The speed of travel may be varied so that the particular conditions of dryness may be precisely adjusted for every variation in the composition of the batch.

the condenser. A small degree of entrainment is unavoidable, but violent frothing may be reduced by skilled handling of the plant and the provision of large heating surfaces and a low steam temperature. Contamination of the coolers, whether of the coil vat or tubular type, is to be avoided by appropriate methods of sterilisation.

The most common defect of condensed milk is "blowing", caused by yeast fermentation. Yeast gains access largely from deposits in the condenser, pipe lines and cooler, and develops most readily if a residual air space is present at the top of the tin. Bacterial defects also occur, but less commonly; growth of bacteria is usually very slight until the tin is opened.

Clotted Cream

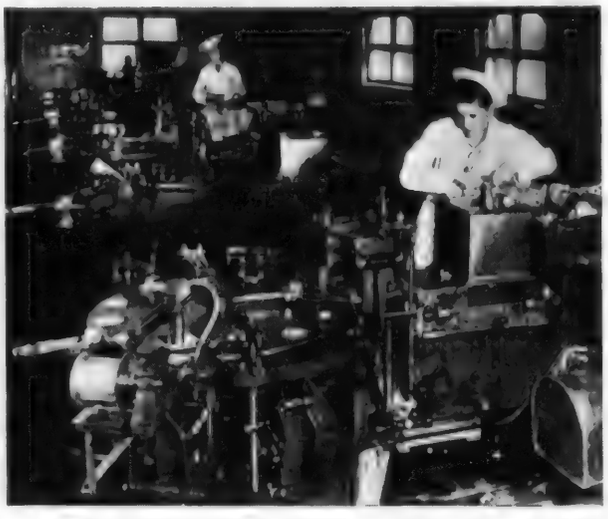
Clotted cream is prepared in large shallow trays set in rows on tables in a special department. The trays are jacketed, with connections both for steam and cold water, so that the heating and cooling operations are done in the same receptacles. The trays are filled with milk enriched with cream, which is heated to the requisite temperature and maintained there until the clotting process is finished. The product is then cooled, skimmed and packed for dispatch.

Soft Cheese

In the main Yeovil factory (there are two in the Yeovil district, one in the town itself and one on the outskirts, where the company has acquired a large piece of land for expansion) are manufactured the well-known St. Ivel and Bondon cheeses. The preparation of the cultures is carried out entirely within the laboratory, and the small cultures are sent out for the preparation of bulk cultures in the factory in glass-lined tanks.

The St. Ivel cheese is noteworthy in that a lactobacillus culture is used instead of the usual streptococcus type. This involves the use of high temperatures and an entirely novel cheese making technique. The main items of manufacture are as follows:

Pasteurised milk is run into tanks and the appropriate amount of lactic culture is added. The reaction concluded, the curd is run off into vats and the whey allowed to drain. Draining finished, the curds are put into presses and the excess whey extruded. In the case of Bondon cheese, it is sometimes blended with cream to bring it up to a fixed butter-fat content. The finished cheese is conveyed to a room so designed that the work is carried on under the most aseptic conditions possible.



The moulds of these Kustner automatic wrapping machines first have tinfoil pressed into them, then they are filled with soft cheese. As the wrapping machine revolves it doubles the tinfoil over the top of the cheese and ejects the complete packet.

During this part of the process no one is allowed in and out of the room. Ventilation is effected by the provision of filtered air. The cheese is conveyed from a hopper to the automatic wrapping machine, by which tinfoil is cut to the required size and pressed into a mould. These moulds are next filled with the cheese, and as the wrapping machine revolves it doubles the tinfoil over the top of the block of cheese and ejects the now complete packet on to a small conveyor leading into the packing room, where it is put into cartons and dispatched.

The work is so arranged that there is no movement of operatives in this room; the operations are very rapid; and at no stage is the cheese handled. By means of these precautions it has been possible to extend the life of this product to almost three times the original. It is, of course, a perishable product, and therefore this increase of durability is of the greatest value and is a tribute to the work of those who devised the methods.

Butter Blending

The butter department not only handles the English butter made in the factory but also blends butter.

An interesting aspect of this blending is that the different markets in this country call for butter of entirely different characteristics, and this involves very skilful blending and a constant adherence to fixed standards. Packing is done by automatic machine, but a special pat of English butter is made up by hand patting and also wrapped individually, although the butter itself is untouched by hand.

Cheese

The company is well known for its long-standing successes in the cheese making field. The varieties manufactured include Cheddar, Cheshire, Caerphilly, Stilton, Cream Cheese and the well-known St. Ivel Lactic Cheese, which is described in another place.

Crustless Cheese

Crustless cheese was first made in England by Aplin and Barrett. The trade has grown so much that a separate factory at Westbury, Wilts, is now devoted entirely to the manufacture of various crustless cheese and fancy cheese spreads. Particular success has been obtained in the preparation in crustless form of certain difficult cheeses such as Camembert and Gorgonzola.

Whey Disposal

A very considerable volume of whey has to be disposed of after such extensive cheese making operations. A portion is returned to farmers for stock feeding; the company also maintains three up-to-date piggeries, which absorb considerable quantities.

Recently, a large plant has been installed for the production of whey powder or condensed whey. This is of the forced circulation evaporator and vacuum band dryer type, and has a capacity of five thousand gallons of whey per day.

The concentrating plant is arranged to work under double-effect conditions, and in view of the temperature sensitivity of the whey the design is arranged so that the temperature of handling at no time exceeds 140° F. The plant in this section is arranged to work on a batch principle, concentrating about 1,500 gallons of raw whey to 70 per cent. solids in about 6 to 7 hours.

The evaporators work on the patent forced circulation principle, and the success of this is evident from the fact that a concentration of 70 per cent. solids is obtained without difficulty.

The evaporators are constructed with stainless steel tubes and tube-plates, glass-lined steel vapour chambers and tinned gunmetal contact surfaces for the other parts of the plant.

On completion of a batch of material, this is transferred to a glass-lined steel holding vessel by means of

This picture shows three interesting processes in the manufacture of Cheddar cheese: the cheese tanks, the curd mill (centre), and the vertical type presses. Besides Cheddar, the company makes Cheshire, Caerphilly and Stilton cheeses.

In collaboration with the Department of Scientific and Industrial Research, the latest system of aerobic percolating filters have been installed for the treatment of wastes. This picture shows the Yeovil sewage disposal plant for creamery wastes.

a pump. The holding vessel is maintained under vacuum and the material is stirred constantly during the holding period.

The next part of the process is the actual drying, and a rather interesting arrangement is provided to transfer the viscous mass from the holding vessel into the feed pump of the dryer. This feed pump delivers the whey under pressure.

The dryer itself is a patent vacuum band dryer, which consists essentially of a number of slowly moving woven wire bands mounted in a cylindrical steel chamber and maintained under a high vacuum. Heating is by means of hot-plates, which are divided into three sections, giving facilities for varying the degree of heat imparted to the product according to its type. There are four bands in the dryer, each receiving a separate feed from a distributor fed by the pump previously referred to.

The whey is delivered at the feed end of the machine in the form of a dried crust, which is broken off continuously and passes through a mechanical breaker into the first of a pair of vacuum hoppers.

In these hoppers the dried whey undergoes further processing, by which it is reduced to a powder of any desired grist, this being done entirely under vacuum by means of a specially mounted grinding machine.

This unique method of grinding *in vacuo* entirely prevents any possibility of heating up of the material during grinding, thus eliminating the risk of sticking due to this cause, particularly when handling hygroscopic materials.

The ground material drops into a further hopper, from which it is periodically withdrawn for packing.

Sewage Disposal

This difficult problem has been closely studied. In collaboration with the Department of Scientific and Industrial Research the latest system of aerobic percolating filters has been installed. This has proved capable of dealing successfully with milk wastes.

The Laboratories

There is complete co-operation between the laboratory organisation and the factory department. All finished products are subjected to chemical and bacteriological tests, and a certificate from the laboratory is required before goods can leave the factory.

Research work is continually in progress, not only on the development of new methods and improvements on old methods but also on purely scientific problems such as new methods of analysis.

Intimate contact between the laboratories situated at the different factories and the central laboratory at Yeovil is maintained, and, in addition, work is carried out in conjunction with the various research institutes. Original work involving new methods of analysis has been carried out on a number of subjects, including the following:

The control of liquid and clotted cream.
Keeping quality of soft cheese.
Bacteriology of starters.
Bacteriology of sterilised cream.
Bacteriology of dried milk.
The coliform bacteria.
Detection of anaerobic bacteria.
Air purification.
The tin content of cheese and cheese-wrapping materials.

SOME SUPPLIERS TO THE FACTORIES OF APLIN AND BARRETT, LTD.

Whey Drying Plant and Whey Evaporator: *Geo. Scott and Sons (London), Ltd.*
Spray Chamber and Evaporator for Dried Milk: *Kestner Evaporator and Eng. Co., Ltd.*
Pasteuriser and Milk Cooler: *Aluminium Plant and Vessel Co., Ltd.*
Whole Milk Pasteuriser: *Graham Enoch and Co., Ltd.*
Bottle-Washing Machinery and Pasteuriser for Bottled Milk: *Auto-Dairy Engineers, Ltd.*
Process Cheese Packing Plant: *Kustner Bros.*
Milk Powder Sifter: *Wm. Gardner and Sons (Gloucester), Ltd.*
Tin and Bottle Fillers and Milk Powder Filler: *Albro Fillers and Engineering Co., Ltd.*
Separators: *Alfa Laval Co., Ltd.*
Homogenisers: *Brush Electrical Eng. Co., Ltd.*
Churn Sterilisers: *U.D. Engineering Co., Ltd.*
Air Filtration: *Visco Engineering Co., Ltd.*
Compressors and Vacuum Pumps: *J. and E. Hall, Ltd.*
Batch Evaporators for Sweetened Condensed Milk: *G. J. Worssam and Son, Ltd.; W. Braithwaite and Co., Ltd.*
Butter Churns: *Hiron and Rempler, Ltd.*
Automatic Recorders: *Short and Mason, Ltd.; Joseph Long, Ltd.; Cambridge Instrument Co., Ltd.*
Distance Thermometers for Cold Storage: *Cambridge Instrument Co., Ltd.*
Labellers: *Purdy Patent Machinery Co., Ltd.*
Tins: *Metal Box Co., Ltd.; John Feaver, Ltd.*
Laboratory Apparatus: *Adam Hilger, Ltd.; Baird and Tatlock, Ltd.; A. Gallenkamp and Co., Ltd.; C. Hearson and Co., Ltd.; Standley, Belcher and Mason, Ltd.*
Alternators: *Crompton Parkinson, Ltd.*
Boiler Feed Pumps: *G. and J. Weir, Ltd.*
Automatic Stokers: *James Hodgkinson (Salford), Ltd.; Bennis Combustion Co., Ltd.*
Pumps: *Gwynne's Pumps, Ltd.*
Cooling Tower for Condensed Water: *Premier Cooler and Eng. Co., Ltd.*
Glass Tanks: *Enamelled Metal Products Corporation, Ltd.*
Glass Bottles: *Forster's Glass Co., Ltd.; Jackson Bros. (of Knottingley), Ltd.; Key Glassworks, Ltd.*

Ample space and freedom from the direct rays of the sun, giving a cool atmosphere, make this milk receiving platform ideal for its important purpose.

CEREALS PROTECTING FATTY FOODS

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National Institute for Research in Dairying, Reading

Oat flour has been found to possess remarkable antioxygenic properties, and these have been utilised in the prevention of tallowiness in dairy products and other fatty foods. The different methods for the application of oat flour in such products as milk, butter, and ice-cream are discussed.

THE PROBLEM of fat protection during the storage of fatty foods has always demanded attention, and the conditions responsible for, or favourable to, fat spoilage are well understood. Methods which have been used for preserving fat in its sweet condition have consisted either of improving the manufacturing processes so that prooxygenic conditions are almost completely eliminated, or of storage at very low temperatures or by the addition of very small quantities of chemical compounds possessing an antioxygenic action to the fat. Butter is an example of the first two methods of preservation. In order to ensure a reasonably long-keeping quality in Dominion butter, high acidity of the butter serum is avoided either by churning sweet cream after pasteurisation or of cream which has been neutralised down to the acidity of sweet cream before pasteurisation. The temperature of the finished butter is kept as low as possible during the stages of handling and sea transport (10° to 15° F.), and some American butter, for instance, is stored at 0° F.

Addition of Antioxygens

The addition of compounds possessing antioxygenic action is not widely practised owing to the narrow range and application of the possible reagents used. The most effective reagents are aromatic amines and phenols, the use of which in foodstuffs would not be permissible and indeed objectionable. Some improvement has been attained by the use of maleic acid or glycerol, but the former can only be used in very small concentrations, since it is of the same order of toxicity as oxalic acid.

Cereal Products as Antioxygens

The protective action of cereal products on fats and fatty foods has been known for a long time. Maize-germ oil, for instance, keeps very well for considerable periods while the germ is in contact with the seed or maize flour, but deteriorates somewhat rapidly when extracted. It has long been the custom to store shredded suet with maize or other cereal flour in order to preserve the texture of the shreds and the keeping quality of the suet fat. Barley and oat flour and rice bran possess similar antioxygenic properties. Barley and rice products, however, are inferior in effectiveness and flavour to oat by-products.

Oat Flour

The latest investigations have been confined to the properties of oat flour. With fatty foods generally the method of application of the material consists of (*a*) intimate mixing or infusion of the flour with the product, such as has been practised with lard, peanut butter and margarine; (*b*) dusting or coating, such as on potato chips and roasted nuts; and (*c*) coating wrapping material which comes into contact with fatty foods with a thin layer of flour paste, such as with lard, butter, bacon and fish. Patents have been issued to cover the properties of oat flour as a food product carrying a "coating of vegetable antioxidative substance", or "an animal tissue carrying such a coating, or a packaging material coated with antioxidative cereal or seed materials, or the stabilisation of fatty glycerides with cereal antioxidants" (U.S.P. 2,026,697, 2,029,248, 2,038,752, 2,049,017, 1936). Special grades of oat flour are marketed. This article sets out to describe the claims of this method of treatment of various dairy products in order to preserve flavour and fat condition and the application of the treatment in food technology.

Effect on Liquid Milk

Although oat flour must not be mixed with liquid milk intended for sale, it will be profitable here to record the results of experiments where this has been done, since proof has thereby been obtained in a simple manner of the antioxygenic properties of the material. The sale of milk in waxed cardboard cartons enables this property of oat flour to be applied to milk by impregnating the paper with wax containing about 30 per cent. of oat flour. It is well known that some samples of milk develop an "oily" or oxidised flavour which can very easily be formed in milk by adding 1 part per million of copper (as a soluble salt) and storing in the cold for 16 hours. Some cows are also known to secrete milk with this pro-

perty, without adding any metallic contaminant to it. It has been found that the addition of only 0·2 per cent. of oat flour to susceptible milk prevented the development of the taint. Further work has been done on milk stored in cartons impregnated with wax containing oat flour in various proportions. Two parts per million of copper were added to the milk to accelerate the development of an oxidised flavour. The control milk exposed to sunlight quickly became tainted, but with 25 to 43 per cent. of oat flour in the wax of the carton in direct contact with milk containing copper and exposed to sunlight no taint was produced. Some oat flavour was confined to the milk contained in cartons waxed with wax containing over 35 per cent. of flour.[1]

Effect on Keeping Quality of Butter

It is obvious in the case of butter also that it is impracticable to mix oat flour with the cream before churning or with butter in the working process, since the flour will confer a high sediment value in both cream and butter and also give positive results in the starch test. Success has, however, been obtained by conferring the oat flour properties to the butter in the following way. One pound of flour is made to a paste with a small amount of water, which is then added to water at 150° F. to make a total volume of 2½ gallons. After standing for 4 hours the clear liquid is poured off and added to either sweet or sour cream in the proportion of 1 part of extract from 1 lb. of flour to 100 parts of cream fat.[2]

It was found that the addition of oat flour directly to the butter was effective as an antioxygen except for the above-mentioned objectionable features. Cream of 0·25 per cent. acidity was mixed with 1 per cent. flour on the fat weight basis and churned. Such butter stored at 40° F. kept well for a period of 8 weeks, when it became slightly stale as against a control sample made from the same cream untreated, which was very musty. The results of experiments made by adding the aqueous extract of oat flour to cream before churning were equally successful in proving the effect of oat flour in prolonging the keeping quality of butter. Based on the weight of cream fat, extracts of flour corresponding to 0·5, 1·0 and 1·5 per cent. of fat were added to sweet, neutralised and poor quality creams. These creams were churned into butter, which was stored at 40° F. The addition of extract corresponding to the 1 per cent. level and upwards materially improved the keeping quality of the butter and was sufficient to give ample protection over a 2 months' storage period. In experiments where 3 parts per million of copper were added to the cream, the resulting butter was again appreciably protected by flour extracts with storage at both 40° F. and −10° F. for several weeks.

Effect on Flavour of Ice-cream

The use of oat flour itself in the ice-cream mix cannot be objected to in the same way as with milk and butter. Flour of this nature can be regarded as a vegetable stabiliser and can be used in amounts up to the proportion that starches and dextrins are used for ice-cream manufacture. It is unlikely that food authorities will interfere with its use in this manner in ice-cream.

Ice-cream, again, suffers from the development of tallowy or related taints during storage. This is especially so with fruit ice-creams, such as strawberry. The presence of as little as 1·5 parts per million of copper in strawberry mix will cause the taint to develop quickly. It must be remembered that the development of the taint in ordinary ice-cream depends on the quality of the constituents containing fat which go to make up the mix, and these should always be carefully selected.[3]

Experiments have been carried out on ice-cream where pro-oxygenic reagents have been deliberately added. Thus, 2 parts per million of copper added to mixes gave an oxidised flavour in 14 days with a straight and a strawberry mix. The addition of 0·5 per cent. of oat flour to the former mix raised its storage period to 16 weeks and the strawberry mix with the same addition kept at least 4 weeks. In making ice-cream of high fat content, it may be found profitable to store cream beforehand. Oat flour added to such cold-stored cream definitely preserves the fat and also gives an ice-cream of superior keeping and other qualities. Thus frozen cream containing during storage (130 days) 1 per cent. of oat flour gave ice-cream which was saleable after 30 days' storage. The cream during storage also contained 2 parts per million of copper. Control frozen cream gave an ice-cream which became badly tainted in 5 days.

The action of oat flour as a stabiliser in an ice-cream mix is also important. A number of experiments have proved that it improves the viscosity of the mix and the body, texture and melting resistance of the ice-cream. It is recommended that the amount of gelatin added to the mix be reduced by 25 per cent. when 0·5 per cent. of oat flour is also added, or the resulting frozen product will be soggy owing to over-stabilisation. In commercial practice, the oat flour swells during the process of pasteurisation of the mix and, in this respect, the pasteurisation temperature which yields maximum viscosity is 150° F. If, on the other hand, the manufacturer does not require oat flour to contribute as a stabiliser, it can be added with the sugar in dry form just previous to freezing, in which case it improves the body of the frozen product. Some cause of trouble in adding oat flour as a gruel arises from the formation of lumps. The addition of the water extract of oat flour is not recommended owing to its weak antioxygenic properties.

Use of Oat Flour for Treating Parchment

In butter stored in parchment wrappings either in boxed bulk or in small packages, the butter surface sometimes becomes tainted with a "toppy" flavour, which is a form of fat oxidation. Some moisture loss is also evident, giving the outside layer a deeper yellow colour than the body of the butter. The storage properties of butter depend largely on the processes of manufacture, especially on the acidity of cream when churning, and butter from low-acid cream keeps best. Many butters develop a stale flavour on storage, a taint which cannot be connected with tallowiness. Although this occurrence cannot be said to be due to the wrapper, sufficient evidence has been collected to prove that if the parchment is provided with a thin coating of oat flour paste this staleness is prevented. This treatment has the additional property

of sealing up the pores of the parchment and retarding moisture loss from the butter surface.[4]

Various butter-producing countries have laid down conditions of quality of vegetable parchment for butter wrapping. One condition deals with a low maximum of water-soluble extract, since glucose or other carbohydrate material is likely to support microbiological growth on the butter surface. It is clear that coating parchment with flour paste goes directly against the enforcement of this standard for hard neutral vegetable parchment as well as invalidating the care taken by manufacturers in the making of the wrapping material.

The Constituent of Oat Flour Responsible for Fat Protection

It can be seen from the work on butter that some antioxygenic constituent of oat flour is water-soluble. Extraction with organic solvents gives an extract (*Avenol*) which possesses strong protective properties, but certain properties of the fat also extracted and traces of solvent left in the extract are objectionable to its use. The water- or solvent-extracted meal still possesses good fat protective qualities. The nature of the antioxygen is thus obscure, and further research is necessary to elucidate the exact nature of the responsible component, which is possibly a compound containing phosphorus in organic combination—*e.g.*, phytin.

Protection of Other Foods

The dusting of oat flour on salted nuts and potato crisps before the fat layer has solidified has distinct protective effects. The use of small quantities of oat flour in the making of biscuits has been proved in certain cases to enhance the keeping quality of the fat in such products. The use of oat flour-paste-coated paper bags for the wrapping of foods containing diffusible fat has been found advantageous. Such foods contained in ordinary paper allow the fat to impregnate the paper at the points of contact; this layer of fat easily oxidises and gives off volatile compounds which initiate fat oxidation in the food itself.

Oat flour has been successfully used to preserve the flavour of the fat of cured meats such as bacon. Sliced bacon wrapped in flour-treated wrappers keeps its flavour much better than rashers stored in ordinary paper. Oat flour (2 to 5 per cent.) also preserves lard from oxidative changes.

Fish may be soaked in 10 per cent. brine and 15 per cent. oat flour or sprinkled with salt containing 30 per cent. flour. This has been found to delay the development of the strong fishy taste which is the main objection to wet or dry-cured yellow fish. Such flour also has been used to preserve fish liver oils, and the protection given to the vitamin A in such oils is of the same order as when organic reagents, such as hydroquinone, are used.

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Dr. Lampitt on Self-Sufficiency and the Scientist

[*Lafayette.*

THE part played by chemists in the effort by nations to secure self-sufficiency was commented upon by Dr. L. H. Lampitt, Vice-Chairman of the Food Group of the Society of Chemical Industry, at the Autumn Meeting of the Society held at the Empire Exhibition.

Dr. Lampitt's address was one of a series on "The Trend of Progress: Where are we Heading?" "The desire", he said, "for national self-sufficiency, stimulated by economic forces, is now emphasised by national fear, and whole groups of chemists the world over are working with greater zeal than ever, with greater issues at stake than the commercial ones, on preservation of food".

Speaking of the tendency of the chemist becoming the servant of the State and thus losing his own individuality, Dr. Lampitt referred to the "parrot cry often heard to-day that science is international". It was nothing of the kind, he declared. Science in such matters as he was discussing was very national. What shall be published in many countries of the world was not decided by the worker but by the Government; because science had become the important factor in national economy and security.

"I can only assume that those who still speak of this Arcadian state of international science live with their heads in the clouds. Citizens meet each other with upraised, clenched fists and the words, 'The State is all'. While the nations tend to that ideal so will the de-internationalism of science continue, a tendency which all true scientists must deplore."

Dr. Lampitt expressed the view that although internationalism in the scientific world was less pronounced than ever before, they were heading towards international agreement regarding certain aspects of dietetics. They were also heading towards Government control of the efforts of chemists in the field of food science; increased knowledge of food production imposed by national economics, increased standardisation imposed by national and commercial considerations, standardisation at lower quality induced by food laws, and a better understanding of the true science of food production and preparation induced by Government action and as a result of a better team spirit between the various scientists.

Canners' Golf at Long Ashton

THE FOOD MANUFACTURE Golf Meeting announced in our last issue takes place on November 1. The course is Long Ashton, Bristol. At the time of going to press, upwards of 20 entries have been received, and the players are looking forward to a pleasant day. To many this is one of the annual highlights of the Canning Convention.

Here is a list of the competitions:

Morning.—Medal Round. 1st Prize, FOOD MANUFACTURE Cup and Replica. 2nd Prize, Eburite Cup and Replica. Special prize for next best net score, presented by Mr. T. W. Winterson.

Afternoon.—Four-ball Foursomes. Prizes for the winning pair presented by Mr. L. Birkett.

A special "Surprise Prize" is also being awarded for a putting competition which has been added to the day's programme for the benefit of non-players.

THE DEVELOPMENT OF MODERN EVAPORATION

BASIL HEASTIE, M.I.C.E., M.I.Chem.E.

APART FROM salt pans which were used for the spontaneous evaporation of salt in dry climates, the earliest attempt to drive water from solutions was an iron pot with burning wood under it.

The evolution of evaporation is briefly the following:

(1) Open fire.
(2) Substitution of steam heating for open fire.
(3) The introduction of the vacuum system of boiling.
(4) Utilisation of the latent heat of the vapour.
(5) Combining these last two into a series of pans, resulting in multiple-effect evaporation.

Numerous refinements have been made in the direction of forced climbing film circulation, etc., and these will be discussed in due course.

Open Pan Evaporation

Open pan evaporation suffers from many disadvantages, among which may be classed low efficiency, uneven temperature distribution and small output.

The introduction of steam boilers led to the first improvement, the steam-jacketed pan.

This gave improved control of temperature and subsequently better economy, but the rate of evaporation from a given surface remained low because fundamental conditions for rapid heat transfer were unfulfilled. Although steam heating was a definite improvement compared with direct firing, the liquor was subject to a prolonged boiling, which caused damage to substances sensitive to heat. In addition, due to static head, the boiling point of a liquor at the bottom of a pan is appreciably higher than that at the surface; this was a further factor causing over-heating of the material.

Vacuum Pans

The next important step was the invention by C. E. Howard of the Howard vacuum pan, patents for which were taken out in 1812 and 1813. By evaporating in a space maintained at a reduced pressure, the boiling temperature was reduced, and, due to the higher difference in temperature between the heating steam and the boiling liquid, the rate of evaporation was increased. With the vacuum pan there is less damage to sensitive liquors on account of the lower boiling temperature—for example, at a vacuum of 26 in. mercury, the boiling point of ordinary water is reduced to 125° F., as compared with 212° F. at atmospheric pressure. A further advantage of the vacuum pan is that it enables low-pressure exhaust steam to be used for heating instead of boiler steam. For example, exhaust steam at a pressure of 5 lb. per square inch has a temperature of 228° F. If steam at this pressure is used in the jacket of an open pan, in which the boiling temperature is 212° F., the thermal head is only 16° F. With the vacuum pan, however, the thermal head is increased to $228 - 125 = 103$° F. Accordingly, the vacuum pan made possible the use of exhaust steam for evaporation with a consequent economy in running.

In 1833, Degrand proved the great economy to be had when the latent heat of the vapour was used to heat the solution to be evaporated before it entered the pan. In 1834, the double effect devised by Degrand was constructed, and, apparently by 1837, triple effects were known.

Calandria Pans

The heating surface of jacketed pans is limited by the dimensions of the pan itself, but in many designs this surface was augmented by fitting internal heating coils. From this it was an easy stage to the calandria pan—that is, a pan fitted with a large number of vertical tubes expanded into large diameter tubeplates. About this time, the importance of securing rapid heat transfer by obtaining a high velocity between the liquor and the heating surface began to be appreciated, and various methods were adopted to this end. For example, the calandria pan was fitted with a certain number of large diameter tubes to act as downcomers, or mechanical stirrers of one type or another were fitted. It was found that stirring, especially in the case of viscous liquors, increased the rate of evaporation and reduced the danger of burning on heating surface. A little later it was realised that if a liquor could be passed over the heating surface at a high velocity, in the form of a thin film, two important advances would be obtained together—namely, rapid

Fig. 1.—Illustration from an old Dutch engraving showing evaporation as carried out in 1630.

heat transfer and minimum boiling point due to the absence of hydrostatic head.

General Considerations

The word "evaporation" is capable of several interpretations. The one adopted here is the application of sufficient heat to a volatile liquid containing solids in solution to vaporise, and thus separate, a portion of the liquid, usually water, from the remainder. The effect of evaporation is to reduce the quantity of liquid and thus increase the percentage of solids present in solution in the liquid—*e.g.*, 10 lb. of salt is dissolved in 90 lb. of water, giving 100 lb. of a 10 per cent. salt solution. Heat is applied to the solution until 50 lb. of water is vaporised, thus leaving a solution made up of 40 lb. of water and 10 lb. of salt, or a 20 per cent. solution by weight.

It is convenient to denote the solids as a percentage of the total weight of solution and not as a percentage of the water or other volatile liquid. Thus, when speaking of a 5 per cent. solution it is understood that there are five parts of dissolved solids present in every hundred parts, by weight, of solution.

In order to determine the weight of water to be evaporated from a liquid containing "A" per cent. solids in solution to give a concentrated solution containing "B" per cent. solids, the evaporation, E, may be expressed as a percentage of the original liquid.

$$\text{Then} \quad E = \frac{B-A}{B} \times 100 \quad \text{(by weight)}$$

—*e.g.*, 1,000 lb. of a solution containing 15 per cent. solids are concentrated to 50 per cent. solids.

$$\text{Then} \quad E = \frac{B-A}{B} \times 100 \quad \text{or} \quad E = \frac{50-15}{50} \times 100 = 70 \text{ per cent.}$$

or 700 lb. of water are evaporated, leaving 300 lb. of liquid containing 150 lb. of solids in solution, or 50 per cent.

When concentrating solutions which have a definite saturation point for a given temperature, concentration cannot be carried out to a higher percentage than that at which the solution is saturated, as further evaporation results in the excess salts coming out of solution. This property has been utilised in the recovery and separation of two salts from dual solutions; a typical example is caustic soda and common salt, the latter, due to its lower solubility, being deposited. Such plants, known as "salting out" evaporators, are provided with separators of large capacity, from which the salt may be removed either continuously or in batches.

Direct Firing

Direct-firing evaporation is nowadays chiefly confined to substances which are not affected by high temperature, such as caustic soda, in which the final concentration is carried out in direct-fired pots constructed of cast iron, or "cascade" concentrators for sulphuric acid, in which the acid flows from pot to pot in a current of hot gases.

Except in special cases such as above, or where a large quantity of hot waste gases are available, direct evaporation is now rarely employed in industry.

The following will be confined to evaporation in single and multiple effect in which the heating medium is steam, the heat being transferred to the liquid through a metal wall.

Single Effect

In single-effect evaporation, steam in condensing gives out its latent heat to the liquid and evaporates a portion, usually less in quantity than the steam.

In multiple-effect evaporation, the vapours evolved from a portion of the liquid are condensed in a separate chamber by a second portion of the liquid, thereby giving up its latent heat to the more concentrated liquid. Thus each effect combines the function of a condenser and an evaporator.

Single-effect evaporation is usually employed for one of the following reasons:

(1) Where the amount of liquid to be evaporated is small and the saving in steam is more than counterbalanced by the higher first cost of a multiple-effect evaporator.

(2) Where the boiling point of the liquid is so high that multiple-effect evaporation is not feasible. In such cases it is often necessary to use a high steam pressure (60 to 80 lb. per square inch) and evaporate under a vacuum in order to lower the boiling point sufficiently to obtain a working temperature difference. A good example is caustic soda and glycerine.

(3) Where the liquid is so corrosive that special materials must be used, such as stainless steel, nickel, and other costly metals, which would render the cost prohibitive in multiple effect.

(4) Where the liquid is extremely sensitive to heat, and it is thus necessary to evaporate at the

Fig. 2.—A Kestner triple effect forced circulation evaporator.

lowest possible temperature, employing very low pressure steam (often below atmospheric pressure) and the highest possible vacuum. Among the sensitive liquids are milk, whey, skin gelatine, fruit extracts, etc.

Multiple Effect

Evaporation in multiple effect is usual where the quantity of liquid is large, rendering the steam consumption in single effect prohibitive. An alternative to multiple effect is the thermo-compression system known on the Continent as the heat pump. It is restricted in its application to liquids whose boiling points do not rise appreciably with increased concentration. However, like the forced circulation evaporator, it is a great advance on the older types; it should be remembered, however, that the idea of using the reversed thermal cycle, or heat pump, was proposed many years ago by Lord Kelvin, while its practical application to evaporators has been rendered possible by improvements made in steam injector design. Multiple-effect evaporators may be operated either under pressure or vacuum. It is customary to limit the stages or effects to two when working under pressure, while the economic limit when working under vacuum is four to six effects, the latter for the production of distilled water from sea water, or other liquids in which the percentage of solids is very low.

Evaporator Design

The basis of evaporator design is the correct estimation of the heat transfer from the steam or other liquid to the liquid. Although numerous papers on the subject have been published in the technical press, it is thought advisable to outline the principles involved to show the difficulties met with in their application.

The quantity of heat passing by conduction from a place of higher to lower temperature is governed, first, by the temperature gradient, or difference between them, and, second, by the resistance to the heat flow of the materials forming the dividing wall.

Consider the heat transfer from steam through a metal wall to a liquid at a lower temperature. Here the heat flowing from the main body of the steam has first to overcome the resistance of the film of condensed steam on the face of the metal. Then it meets the resistance of the metal wall and finally a more or less stagnant layer of liquid, whose thickness is some function of its viscosity, and the velocity of the main body, the flow of heat through this layer is a function of its specific heat, specific gravity and thermal conductivity.

Heat Transfer

It is usual in the literature dealing with heat transfer to denote these resistances in terms of their conductances.

Let r_1, r_2 and r_3 denote the resistances of the condensed steam, film and liquid film.

Then $r_1 = \frac{1}{h_1}$, $r_2 = \frac{1}{h_2}$, $r_3 = \frac{1}{h_3}$, where h_1, h_2 and h_3 are their conductances.

The total resistance to heat flow $(R) = r_1 + r_2 + r_3$.

Let H = the heat units which will flow through unit area for one degree overall temperature difference.

Then H × temperature difference = quantity of heat (Q) flowing per unit area.

$$\text{Now } H = \frac{1}{R} \quad \text{Therefore } H = \frac{1}{\frac{1}{h_1} + \frac{1}{h_2} + \frac{1}{h_3}}$$

The value of H is thus seen to depend upon the determination of three factors—viz., the conductance of:

(1) The condensed steam film.
(2) The metal wall.
(3) The stagnant liquid film.

A fair approximation may be made for the first, while the heat conductivities of most metals are known, but the third conductance is impossible to determine with any degree of accuracy, especially where the evaporation occurs in the tubes, or where the circulation is thermal.

Forced Circulation

In the case of forced circulation, in which the evaporation occurs in a separate vessel, or flash chamber, a much closer determination can be made, as the velocity of the liquid in the tubes is known, and if the physical constants of the liquid are also known a fairly close approximation can be made. This is a point in favour of the forced circulation type for liquids on which no previous evaporation tests have been made. In the ordinary type depending upon thermal circulation the designer must be guided by experience gained from tests made on similar liquids.

Without question this method of separating the film coefficients is sound in principle, but whether it will replace the usual method of assuming a value for an overall H from previous tests (when available) is doubtful, as the difficulty of evaluating the factors involved in any film-coefficient formula is great. The problem is often further complicated by the presence of mineral scale, or oil of varying thickness, density and composition on the surface of the tubes.

High Rate of Heat Transfer

In order to obtain a high rate of heat transfer from the steam to the liquid the following conditions must be fulfilled:

(1) The velocity of the liquid in contact with the tubes must be as high as possible.

(2) The condensed steam must be removed as rapidly as possible from the tube surface.

(3) Incondensable gases—*e.g.*, air present in the steam—must be vented to prevent an accumulation, as the heat transfer from gases is very low. The presence of air reduces the partial pressure and consequently the temperature of the steam. This trouble occurs more frequently in the second and third effects of a multiple-effect evaporator, where incondensable gases are evolved from the vapour.

SPECIAL TYPES

Film Evaporators

Many different types of film evaporators have been evolved, and many of them failed, mainly on account of the impossibility in practice of obtaining a sufficiently even distribution of liquor over the heating surface.

In one type, an attempt was made to obtain a film by making the evaporator in the form of a circular trough, the heating surface consisting either of a steam coil or a series of hollow discs secured to a horizontal rotating shaft. In this way the coil or the discs were continually kept moving through the boiling liquid. Obviously, with this arrangement the relative velocity between the heating surface and the liquid was low and the disadvantage of prolonging the boiling still remains, together with the obvious mechanical difficulties.

It was left to a Frenchman, Paul Kestner, to evolve an evaporator which satisfied the theoretical requirements for rapid heat transfer, and, at the same time, solved many practical difficulties which hitherto had prevented the widespread adoption of the film principle.

Essentials of Film Evaporation

Fig. 3 shows the essentials of this continuous film evaporator and, although there are now many variations of the type for special purposes and many improvements in constructional detail, the basic design still remains the same, and the success of this evaporator is proved by its adoption in all industrial countries.

The liquor enters the bottom box at a temperature approaching the boiling point, and as it starts rising up the tube ebullition commences practically immediately. The vapour thus produced tends to rise up the tube and carries with it the liquid in the form of a rapidly moving film in contact with the inner surface of the tube.

As the liquor rises further evaporation occurs, and there is a gradually increasing velocity which results in a high rate of heat transfer.

The ratio of tube length to tube diameter is carefully adjusted for the optimum conditions.

At the top, the mixture of vapour and concentrated liquor leaves at a high velocity and enters the separator tangentially, where centrifugal force effectively separates the vapour from the liquor. The vapour passes away either to atmosphere or to the condenser or to the next effect, as the case may be, while the strong liquor leaves at the lower outlet from the separator.

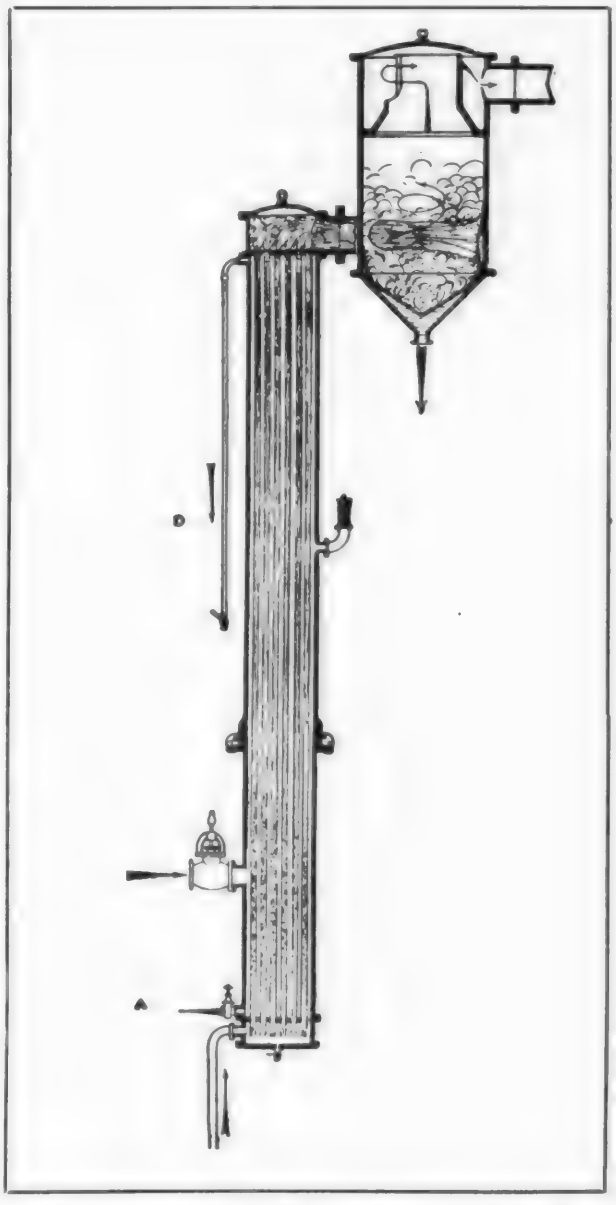

Fig. 3.—Section of the Kestner patent climbing film evaporator.

Practical Advantages

This evaporator has many practical advantages compared with previous types of film evaporators. For example, the time of contact with the heating surface, instead of amounting to so many hours, is a matter of minutes or even less, and, at the same time, the heating surface operates at the best efficiency, due to the high liquid velocity.

The effect of hydrostatic head is minimised, since the liquid is carried through the tubes in the form of a film and the tubes are not full of liquid.

Due to the high rate of heat transfer, a relatively small surface is required for a given capacity, so that the number of tubes and the tube joints in the tube plates are reduced. It will be realised that in the calandria pan, where a large number of tubes of small diameter are employed, the tube plates are of large diameter and there is frequently trouble with leakage at the tube plates. At the same time, it is obviously easier to clean a small number of large diameter tubes than a large number of small diameter. Another feature of the plant, the advantage of which is not always appreciated, is the very small volume of liquid in the evaporator at any time which tends to avoid serious entrainment—or, in other words, boiling over—when a change in the vacuum or other operating conditions occurs. Moreover, the efficiency of separation in the tangential separator is very high.

There have since been many variations of the original type shown in Fig. 3—for example, there is the climbing and falling film type, in which the liquor passes up one set of tubes and down a second set. This is used in cases where a relatively high percentage evaporation is required, or where for practical reasons it is advantageous to discharge the concentrated liquor at a lower level.

Another form is the Serpentine type, where more than two passes are employed, this type being used for liquors which require an exceptionally high degree of concentration.

Multi-Circulation Type

A still later development is what is termed the multi-circulation climbing film evaporator. In this design there are two or more sets of climbing film tubes, each set being provided with a separator at the top of the calandria. The liquor passes through the sets of tubes in series, while the vapour passes off in parallel to atmosphere or to the condenser.

This evaporator is used principally for very sensitive products such as milk and fruit juices, and Fig. 2 shows one of the triple circulation type in course of erection in a condensed milk factory. The evaporator works under high vacuum and combines the advantages of rapid evaporation at a low temperature and extremely short time of contact.

It is claimed that the high liquor velocity in the tubes and the low temperature of evaporation very greatly reduce scaling of the tubes, which with milk, for example, is always a difficulty. Evaporators of this type can be run a full working day of 24 hours on milk without cleaning, and eventually this operation, when required, is very rapidly and easily carried out.

Fruit Juice Concentration

As a matter of interest, it may be mentioned that when applied to the concentration of fruit juices a special patented modification to this evaporator enables the flavouring compounds, which tend to be evaporated with the water, to be recovered separately. These are then returned to the final concentrate, and the result is a concentrated fruit juice containing the original flavour of the juice.

(*To be continued.*)

Food Analysis in New York

The author, who is chemist to the Bureau of Foods and Drugs, Department of Health, New York City, has indeed filled a long-felt want with this comprehensive book on food analysis. Evidently it is a record of methods used officially in the Department, and it is made especially valuable by the incorporation of unpublished work. The newer aspects of food analysis, such as the chemical assay of vitamins and the detection of homogenisation and improper pasteurisation of milk, have been included.

It is disappointing, however, that some of the recent advancements in analytical technique have been ignored —for example, Dr. Clark's "Colorimetric Estimation of Tin", Chinoy, Edwards and Nanji's "Iodine Method for the Determination of Starch", and Monier William's "Arsenic Estimation". Again, no mention is made of selenium as a catalyst in Kjeldahl estimations, but the suggestion to use perchloric acid in the destruction of organic matter seems to be an improvement. The index is satisfactory, but could with advantage be further extended. The whole subject-matter is well presented and the book can be highly recommended to students of food analysis and as an invaluable guide in the analytical laboratory.

S. M. T.

The Chemical Analysis of Foods and Food Products. By Morris B. Jacobs, Ph.D. Pp. 537. 1937. 25*s. net.*

Canning Work Progress at Campden

(*Concluded from opposite page.*)

(1) The texture of harvested peas appears to be virtually unaffected by application of artificial fertilisers to the soil.

(2) Application of fertilisers alters the mineral composition of the peas. Addition of common salt has a marked effect on the mineral composition.

(3) Early cutting and rapid drying tend to give peas of firm texture and low swelling properties.

Horner, working on the "Mineral Content of Canned Vegetables", finds that considerable loss of potassium and some loss of phosphate occur during blanching, and further losses of all constituents are occasioned when the covering liquid is discarded.

A method of determining the internal capacities of cans is described by Adam and Stanworth, who also record the variations in capacities of commercially packed cans (all the cans of each size were identical before seaming and filling).

A progress report on "Studies on the Mould *Byssochlamys fulva*" is given by Gillespy. Researches at present in hand at Campden cover a wide field and the nature of the work is such that positive results can only be recorded after many confirmatory tests have been made. The paper gives a general indication of the work in progress and some of the tentative conclusions arrived at.

Annual Report of the Campden Research Station tells of

CANNING WORK PROGRESS

IMPORTANT EVENT for the Canning Industry was the publication early in October of the annual report of the Campden Research Station covering the year 1936-37.

In his introduction the Director of the Station, Mr. F. Hirst, M.Sc., A.R.C.S.C., says: "A glance at the subjects dealt with in the present report will make it clear that the Station is at present concerned chiefly with improvement of the general quality of canned produce and the study of nutritional values.

"At research institutes in America and France much work has been carried out on the vitamin content of canned food, but the equally important problem of the mineral content of such products has received less attention than it deserves. This subject has been studied recently at Campden, and details of the distribution of mineral salts in canned peas, beans, carrots, and potatoes are included in a paper contained in the present report.

Feeding Tests on Rats

"During the past year the Station has again kept in close touch with the feeding tests at the Rowett Research Institute, which are now nearing completion. In these tests—which have been in progress for 18 months—several generations of rats have been bred, one set being fed on 'fresh' foods and another set on canned foods. The results should give a valuable indication of the total nutritional value of canned foods as compared with fresh foods.

"Although the number of cases of alleged food poisoning in this country is small, it is of the utmost importance to all concerned that a thorough scientific study of the available evidence should be made whenever possible. To serve this end arrangements are being made to refer problems of this nature to the leading medical authority on the subject and to carry out such tests as may be necessary at this Station."

A sample of the activities of the Campden Research Station well illustrates the width and value of the work carried out there. The Report, describing the advisory work undertaken during the period under review, tells of the examination of raw materials and finished products, and the laboratory study of problems submitted by canners—162 individual items having been dealt with. During the same period 705 technical enquiries were dealt with through the post and in addition telephoned enquiries elicited much information; 293 samples of canned products were examined and reported upon.

"A small number of cases of illness alleged to be due to the consumption of canned vegetables have been investigated on behalf of canners and in all of them careful enquiry showed that canned products were not responsible for the illness complained of," says the Report.

Members of the staff made many visits to factories to assist in the solution of technical problems which had arisen, and in the same way many firms sent representatives to visit the Station with a similar purpose.

No fewer than 4,487 samples of National Mark canned fruits and vegetables were examined on behalf of the Ministry of Agriculture.

In reporting upon the research and experimental work carried out, it is stated that over 1,100 separate experiments were conducted in the course of a year, including tests upon fruit, vegetable and milk products. Canning trials are still held, but so complete has the groundwork been on the commercial varieties that it now remains only to examine new varieties as they are introduced.

Important work has been carried out on hydrogen swells. Not only have experiments been conducted which indicate the chief sites of corrosion in a can and type of lacquer film required; but also work has gone forward with a view to reducing the susceptibility of the steel base plate itself to corrosion.

Another direction in which research has been undertaken is an investigation of thermophilic bacteria in sugar. It is hoped that when this work is completed it will be possible to eliminate this contamination from sugar so that the quality supplied to canners may be of a guaranteed standard. In the same way further research has been undertaken on the question of heat resistant moulds.

Vitamin C Studies

Wherever canning research is carried out, the effect of the process on the vitamin C content of vegetables is being studied. This question naturally forms an important part of the work at Campden. Special attention is being given to the effect of holding the vegetables for relatively long periods before and after blanching. Heat penetration and acidity of fruits are other subjects to which the report refers in outline.

Several very interesting papers are included with the report, adding enormously to its value.

Hirst and Adam, in a preliminary report on "Fruit Gumming of Victoria Plums", draw the following tentative conclusions:

(1) Gumming appears to be a varietal characteristic and is influenced by seasonal conditions.

(2) The greater part of the gumming is probably due to physiological causes, but some is undoubtedly due to external injury or insect damage.

(3) Rootstock and the age of trees appear to have little influence on the extent of gumming.

(4) Grading by removal of fruit showing external gum does not separate the plums according to whether they contain internal gum or not, but it is possible that grading according to the position of external gum may give a better separation.

Tin in Canned Foods

The "Presence of Tin in Canned Fruits and Vegetables" is the subject of a paper by Adam and Horner, who conclude that the work of certain other scientists has shown that the risk of chronic "tin poisoning" from canned fruit is extremely remote.

Figures given in the present paper show the existing position in regard to canned fruits and vegetables, and the value of improvements in lacquering which have been or are being made.

The effect of factors such as temperature and time of storage, type of lacquer used, state of ripeness, and hydrogen ion concentration is given, and it is shown that fruits and vegetables in lacquered cans seldom contain more than 40 mg. of tin per kg., even after long storage.

Low as these figures are, it may be possible to reduce the tin content in lacquered cans almost to zero, if the developments which are at present in the experimental stage can be put into commercial practice.

Horner, in a paper on "The Losses of Soluble Solids in the Blanching of Vegetables", summarises his work as follows:

The effect of the blanching process on the sugar content and nitrogen content of three vegetables is described, and the losses of these constituents tabulated. Steam blanching causes much smaller losses of sugar and protein, while the amount of shrinkage is also less than is the case with water blanching.

In a paper on "The Composition and Texture of Dried Peas", Adam concludes that:

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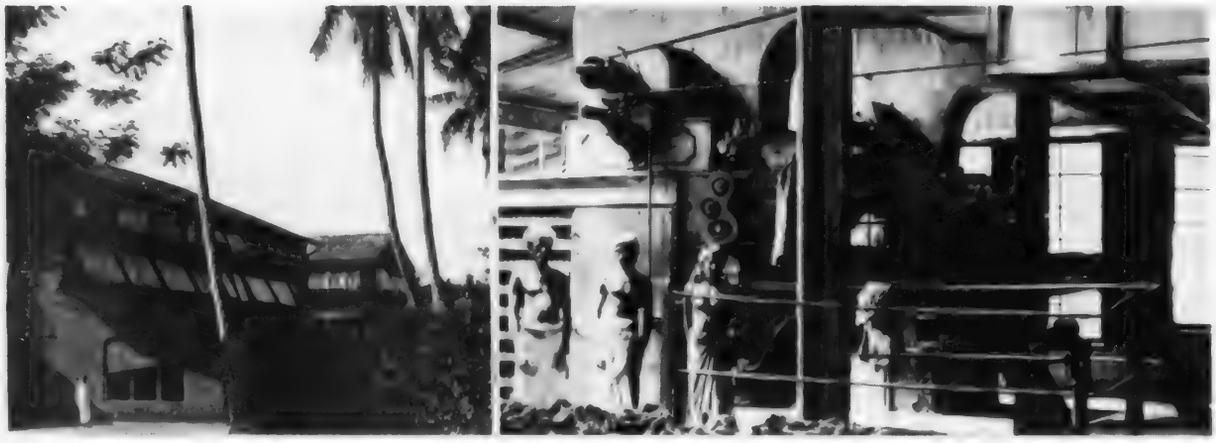


FOODS IN CEYLON

EVEN IN Ceylon the subject of food protection comes up periodically and has been under discussion for more than thirty years. The present excuse is that there is no money available. When there was money available the excuse was that there was no time to carry the matter through. The Press periodically ventilate the deficiency, in reviewing analysts' annual reports, but the question ends, as before, in talk.

Milk

The larger towns have municipalities to control their affairs and lay down by-laws for their officers to follow. The municipality of Colombo (the capital of Ceylon) investigated the subject of milk supplies in 1904, and standards were laid down for cow and buffalo milks after examination of the milk of 500 animals from each class. The standard has only of recent years been accepted by the Government; for cows' milk it is 3·5 per cent. fat and 8·5 per cent. S.N.F.; for buffaloes' milk, 7·0 per cent. fat and 9·0 per cent. S.N.F. (solids-not-fat). Nearly half of the milks tested for Colombo City fall below the standard in S.N.F. and about a quarter are below the fat standard. The added water figures rise to 80 per cent. and the fat deficiency to 70 per cent. The fines imposed are inadequate to stop adulteration, as it pays the vendors to do so. The maximum fine in Colombo is about the equivalent of £10 for the double offence of selling adulterated milk and selling milk without a licence. The smaller municipalities impose a fine of the equivalent of 2 to 3 shillings, so as not to cause hardship on the poor milk vendor. Poverty is a great protection in Ceylon. In small towns and villages adulterators of milk get off, as before prosecution can be successful the authority has to prove that the adulterant is dangerous to health, and as malnutrition is dangerous to health it appears the case is proved, but the authorities are difficult to move in the matter.

The fact of there being two classes of milk in Ceylon and two standards makes control difficult, as no milk vendor ever declares buffalo milk on sale but always cows' milk, so that he will be on the lesser standard. By diluting down buffalo milk with water, a tolerable cows' milk (standard) can be obtained. Often cow and buffalo milks are mixed with water and the standard risked, the vendor declaring the mixture as cows' milk. Sugar is sometimes added to bring up the specific gravity. "Jaggery," the crude sugar obtained by evaporating the juice from the excised inflorescence of the coconut palm, is a common form of adulterant when sugar is added. Sometimes auction sales of condensed milk at H.M. Customs bring in a cheap supply of available milk which is held in readiness in case a shortage of fresh milk takes place. Tinned milk is thus another source of sugar. Rice "canjee" is another thickener used, which is simply rice boiled up into a thin gruel.

Imported milk has a separate standard on dilution (according to given directions)—viz., fat, 3·6 per cent., and S.N.F., 8·8 per cent. Separated milk is admitted to the island only on license to oblige the process milk manufacturers, of whom there is one in operation. The imported milk standard for India is less than for Ceylon. Manufacturers have been known to make the mistake of sending tinned milk to Ceylon with the Indian standard, consignments addressed Ceylon, India—a geographical error resented in Ceylon.

Manufacturers of condensed milk and powdered milk, by the simple expedient of placing the word "food" after milk are able to bluff the authorities, as Milk Food is not milk in their minds, although made entirely from milk. Such foods are generally low in fat compared to the standard. This question is now being taken up.

Tinned milk is imported into the island in large quantities. Some tins are attacked, tin being found generally in the ash. The attacked tins are etched on the inside and a grey deposit can be rubbed off the tin.

Arrack

Arrack, the distilled spirit from fermented coconut toddy, is under control. Impurities are generally copper and acidity. Copper originates from the copper stills

Since 1930 the area under tea in Ceylon has steadily averaged about 556,000 acres. Similarly the production of tea has been steady, amounting in 1936 to 220 million pounds. These figures give point to the pictures on the left. The first is a view of the tea factory on the New Peradeniya Estate in Ceylon. Next comes a view of the interior of this factory, showing the tea driers.

Right is shown the interior of a confectionery factory in Colombo. Lozenges are being made, and in the background are the almond pans.

An account, sent to us by a prominent food analyst in Ceylon, of the state of affairs in that country.

used in the distillation. Regulations as to tinning the inside of the stills have little beneficial effect, as the galvanic action between copper and tin in the presence of acid hastens the corrosion of the copper. Acidity from acetic acid originates from over-fermented toddy. The maximum amount of copper permitted in arrack (27° U.P.) is 0·25 grain per gallon.

Whisky

An establishment had continual complaints regarding their whisky and soda. On testing, the whisky was found to contain copper. The bar-keeper blamed the locked-on whisky measure (a plated brass instrument). On using the measure 100 times instead of the 20 measures usual in a bottle, it was found that there was very little increase in copper. There is a strong suspicion that arrack was being mixed with the whisky. The variation in price is 1 : 8, and hence the temptation. Actual use of arrack to adulterate whisky is difficult to detect chemically, as arrack is quite a good spirit and is now three years old before it is sold. The presence of copper in the blend is the only indication that arrack has been added to whisky, since whisky is usually copper free. The percentage of alcohol in standard whisky imported into Ceylon is higher than the U.K. standard. Distillers have been known to neglect this point and the consignment has been refused admission. To bring low alcohol whisky up to Ceylon standard, new silent spirit is added. This again is rejected as not being fully matured.

Vinegar made in Ceylon is wine vinegar made from coconut toddy. There are no standards for coconut vinegar. Acetic acid (used for coagulating rubber latex) is now being diluted with water and sold as vinegar.

Tea

When tea prices were high, factory sweepings from estates were sold at auctions or at the factory door for salvage of the good tea that had got mixed up in the sweepings. The caffeine is predominant in the hair of the tea fluff which floats about the factory, finally settles, and is swept up with the rest of the refuse—nails, tea-lead, wooden chips, sand, gravel, and tea leaf, etc. Caffeine and a yellow dye can be obtained from tea. When prices were lower, such sweepings have been denatured with asafœtida and exported to the chemical works. The profit obtained from salvaged tea, and the high price of tea, developed the ingenuity of the small traders. Tea prunings were treated with potassium permanganate, lime, and/or "cutch" (tannin), rolled and fired, and even exhausted leaf and foreign leaf were stated to be added, but the latter was found to be an exaggerated statement. Salvage was carried out by sieves and basket winnowing, but not under the best sanitary conditions. It was difficult to get workers for this class of work, as the tea fluff penetrated everything. Salvaged tea when infused with boiling water was not objectionable, as any sand sank to the bottom of the teapot and the infusion was more or less sterile due to the heat. If the water was not pure to start with bacteriologically, it was improved by the boiling. Such conditions were fairly satisfactory for Ceylon consumers of the lower classes, but when dealers exported the teas to lesser tea-consuming countries the authorities had to take steps to stop this trade. This Bill was known as "The Rubbishy Tea Ordinance", and caused a lot of commotion in the local tea trade. Now that tea prices have fallen such trading is impossible, as economy has shut the factory doors.

Areca Nuts

Areca nut cut in thin shavings is chewed along with betel leaf and "chunam" (partly burned coral). Such chewing is common among the local people. Areca nut cultivation is a minor industry in Ceylon and a part of the produce is exported. It was found that to improve the appearance of the areca nut various facing powders were used. As workers in areca nut mills were complaining of illness, and surrounding inhabitants of the dust,

facing powders were examined, and found to consist of saffron and oxides and chromates of lead and iron compounds. Such facings were promptly stopped. Some of the workers were found to suffer from blue gum lead poisoning.

Water

Generally, water supplies are good, mostly soft, as lime is deficient in tropical countries except in certain districts where there are dolomite outcrops. The coastal belt is not so well supplied with good water, as the collecting area is raised sea beach impregnated with coral yielding brackish, peaty, hard water. Considering the rainfall in Ceylon in some parts is over 200 inches per annum, there is no excuse for any part of Ceylon being without a good water supply. Colombo City water supply is passed through Jewel Filters and chlorinated, and is a first-class water supply. Aerated or carbonated waters in the past were impregnated with copper and lead, but these impurities were eliminated. Aerated water factories are under supervision and the products as a whole are satisfactory, yet strangers drink imported foreign mineral water at great price.

Confectionery

Bread and flour products are well prepared. Weevily flour has been known, but is generally stopped at the Customs. Ceylon being centrally situated geographically for flour it is not necessary to keep large stocks. Biscuits are made locally, and although not of the standard of imported biscuits, the make-up is imitated.

Due to transport, and under present economic circumstances of long storage, some sugar imports are not satisfactory on arrival at the port, and reports by commercial surveyors give the cause as "inherent vice". This is merely a layman's phrase. The cause of the deterioration of the physical qualities of sugar from free crystals to adhering crystals having the appearance of dampness is traced to acidity and reducing sugar. When the stains on the bags are patchy it is caused by external dampness, and the crystals of sugar are free away from the stains on the bags and in the same bag. When the condition is initially internal, sometimes extending to the bag, it is due to the fault of the sugar—"inherent vice" or "sweat of sugar". Such latent action is accelerated by adverse conditions of travel. There is no sea water damage in such cases.

Complaints are made of both beet and cane sugar and from several different countries of origin.

Fats

Ghee is clarified butter, sometimes flavoured with the addition of spices. Cow or buffalo ghee is an expensive food, and is sold at Rs. 5 per bottle ($\frac{1}{6}$ of a gallon). There is thus a great temptation to sell for ghee that which is not ghee. Vegetable ghees are on the market which are supposed to be free from animal fat, yet samples will not stand the tests. Animal fats are prohibited by some religions and hence the difficulty.

Coconut oil enters largely into foods. Coconut oil quality has improved enormously in the last fifteen years. The free fatty acids are often below 1 per cent., rarely are they up to 3 per cent., against previously 3 per cent. for first quality and over 5 per cent. for ordinary oil. The improvement has been made by picking the copra, rejecting mouldy, badly dried copra, and using metal containers for the oil instead of wooden vessels, which were dissembled in Europe and returned to Ceylon to be used again. Extraction of the oil-soaked wood showed 50 per cent. free fatty acids, and so were faulty containers for good fresh oil.

Although Ceylon is an agricultural country yet she is not self-supporting, importing large quantities of rice and curry stuffs from Burma and India. It is stated that the greater profits in other agricultural products such as coconuts and rubber spoiled the Singhalese for hard agricultural labour. Complaints are not made about food products except from sea damage.

Fish

Fish enters largely into the diet of the local people. A European company trawl for fish, freezing it until sold. Local fishermen were offered a mechanically propelled boat to introduce more up-to-date fishing, but it was refused. Dried fish is imported from the Maldive Islands, lying about 400 miles south of Ceylon. Some years ago there was a supposed outbreak of cholera on certain tea estates. This was traced to the coolies digging up the fish manure and putting the fish in their curry. The fish was cut smaller to avoid this and finally imported as ground fish guano. Due to the high temperature and humidity, fish is prone to decomposition, and is often seized by food inspectors as unfit for human consumption.

Local Manufactures

Tubers (yams) and cassava (tapioca), for example, if not properly prepared by washing, cause death from prussic acid. This is happening continually.

Except for tea, desiccated coconut, and coconut oil there is no manufacture of food products. One firm makes a good quality of boiled sweets, which importers find difficulty to compete with in the class of goods made.

Canned goods locally manufactured do not exist in Ceylon. There are bottled fruits and chutneys exhibited at agricultural shows prepared on a cottage industry scale, but not on a manufacturing scale. Correspondence with the canning U.K. authorities was not altogether satisfactory; catalogues were not forthcoming and sizes of tins were not in water content but diameter and height, which one had to calculate. When that was done it was found the American ton was the standard used. After many months of irritating correspondence the subject of canning of foods was not prosecuted further as the cost of the tins was too high. If any canning is done in this country the cans will require to be made in Ceylon, as the freight is the same on full or empty cans. There could be no export with imported cans, and if there is no export there is little use of canning.

A PLEA FOR MORE FOOD RESEARCH

Sir William Crawford on The People's Food

Sir William Crawford, in collaboration with H. Broadley, has recently written a book, *The People's Food*. In it he insists that in both the scientific and economic aspects of food consumption there are vast fields of research waiting to be tilled.

"There are many millions of people in Great Britain to-day spending enough on food to provide themselves with such a diet as the B.M.A. or the League of Nations have prescribed, but because that expenditure is not wisely directed they are denying themselves essential nutrient constituents." That is the keynote of the book.

When one comes to think about it, much more scientific attention has been given to the rationing of livestock than to the feeding of human beings. Whoever hears of the term, balanced rations for men and women? Yet this is a commonplace among farmers. Cows and pigs are more suitably fed than most humans—even those wealthy enough to buy any food they wanted.

The chief object of this book, which could hardly have appeared at a more opportune time, is the economic bearing on business of the facts collected. It is pointed out that even in the early years of the present century a survey would have shown that the number then found to be falling short of an adequate standard of diet would have been twice or thrice the relatively small figure which the book reveals to exist to-day. The outlook, therefore, is not pessimistic.

With the continous improvement in the standard of living a huge new market is being created for the food producer and the food manufacturer. It is in this connection that the book makes a special appeal to farmers and food manufacturers.

The authors' facts are derived from investigations into some 5,000 households and of 18,500 individuals in all classes of the social scale in seven big cities. The result is a vivid portrayal of present-day habits and customs in regard to the food purchased, how it is purchased, how it is handled, and when it is eaten.

This will be a very valuable survey from an historical point of view. If a similar one had been made 50 years ago we could have said with certainty whether we had progressed or not. As a result of it all, the authors urge the immediate institution of a national campaign to awaken the public to an understanding of the importance of foodstuffs in creating and maintaining healthy bodies.

They insist that a Food Research Institute is necessary, as there is still much work to be done on such problems as the influence of freshness of foods on their nutritive value and so on. The book demands consideration.

T. H. F.

The People's Food. By Sir William Crawford, K.C.B., and H. Broadley. Pp. 336. *12s. 6d. net.*

Utilising Fats

The primary consideration of this monograph is to present a clearer picture of the relation of structure of fats to their utilisation. This has been achieved largely as a result of the replacement of the usual tables of iodine, saponification and other average values, and the classification based upon them, by tables showing the composition of fats in terms of fatty acids and, where possible, glycerides. As the author states, the result of this is to envisage the bio-chemical synthesis and technical application of fats from the standpoint of structure rather than general characteristics.

The very extensive developments which have taken place both in fat chemistry and fat technology during the last decade are summarised. Four parts of Chapter I treat of constituents and properties of fats, and stress is laid here, as in the other parts of the book, upon physico-chemical methods and results. Analytical methods are well covered and the latest methods are described.

The chapter on artificial fats, which covers the synthesis of glycerides and hydrogenation, is a valuable one, and the last subject is explained by no less than eighty-two references, which cover most of the work done and the patents applied for up to a very recent date.

The edible fat industries are discussed, and material for salad dressings, fish canning, oil frying fats, chocolate fats, baking fats, fats for cakes and biscuits, butter, margarine, and other products are described. Bio-chemistry of edible fats and the important problems of rancidity follow up the general considerations of edible fats. The inclusion of the fat-soluble vitamins will be of interest to the bio-chemist.

Throughout the work the bibliography is very fully looked after and the index is an excellent one. This book may be confidently recommended to anyone interested in the subject.

Utilisation of Fats. By H. K. Dean, B.Sc., Ph.D.(Liv.), A.I.C. Pp. 292 *and Indexes.* 15*s. net.*

Sugar Manufacture for the Layman

A tendency of fairly recent growth is for books to be written on scientific and technical subjects by experts for the layman. These are written somewhat differently from the miscellaneous "Science for Everybody" style, which skims lightly over abstruse subjects.

In his preface, J. G. Davies says that his book is written for "the non-technical reader who possesses very little or no knowledge of cane sugar manufacture", and forthwith writes a book which compares with quite a number of books written on various technical subjects for the expert.

The reviewer wonders what type of ordinary layman would be attracted by this book, and can only imagine that the author has had his eye on those who live in the proximity of a cane factory and whose friends and acquaintances would exact from them some of the knowledge imparted by the book.

The essential operations of the manufacture of sugar from cane is well described, as is the machinery used. Evaporation, crystallisation and separation are operations that are well covered.

Among other subjects treated are: processes of the manufacture of direct consumption sugar; fancy molasses or cane syrup, which is manufactured from the cane juice. This product should not be confused with golden syrup, which is a refinery product. Fancy molasses contain all the constituents of the original juice, except those substances precipitated by the clarification process.

The illustrations are good and the whole work is characterised by its clarity and economy of description, which has excluded redundant matter.

It might be suggested that on reaching the end of this book, after a careful perusal, the layman may well have lost his right to that title, as far as cane sugar is concerned.

T. C.-W.

The Principles of Cane Sugar Manufacture. By J. G. Davies. Pp. 144. *10s. net.*

FISH FILLET

E. Holten, C.E.

FIG. 1.—Ground-plan of the fish fillet factory at Skelskør.

FIG. 2.—Cooling tank for fish fillets, with cooling coils built in.

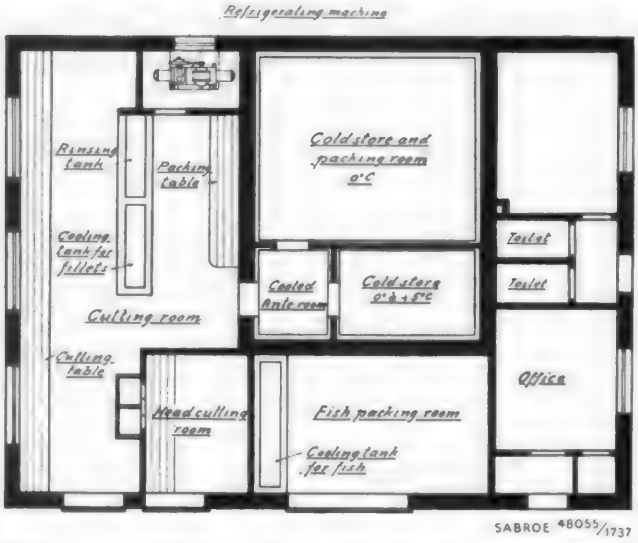


FIG. 3.—Ground-plan of the fish fillet factory at Rønne.

THERE ARE in Denmark sixteen fish fillet factories which have been licensed by the Danish Government to export fish fillets to foreign countries.

In 1930 the first fish fillet factories of any importance were built in Skelskør and Fredericia, two Danish fishing harbours, situated one on the "Store Bælt", the other on the "Lille Bælt". These factories were planned by the suppliers of the plant in collaboration with fishery experts and built according to those plans.

The two factories were practically identical as to capacity and plan. As they were experimental factories the construction was rather complicated, with freezing devices and ice-making plant, whereas the arrangement of the fillet factories was based upon experience obtained from a few fillet factories already in existence.

Planning of Factories

Fig. 1 shows the ground-plan of the factory at Skelskør as it was originally designed. The freezing devices, however, were employed very little, as it soon became apparent that a proper freezing of the fillets was neither necessary nor desirable for export to potential purchasing countries. Among these countries Switzerland is the most distant from Denmark, and to this country the unfrozen but systematically cooled and well-iced Danish fillets arrive in excellent condition. As in Europe unfrozen fish fillets always obtain better prices than those which are frozen, there is naturally no reason for undertaking a rather costly freezing. The two factories at Skelskør and Fredericia are still working on the original principal with but small alteration to the working scheme.

Since 1930 several other fish fillet factories have been erected in this country.

Special Regulations

The Department of Fishery has drawn up special regulations for the cooling down of the fillets, and the fillet factories are kept under very severe control with regard to such cooling down and cleanliness.

In this way it has been possible to create a very fine Danish export product which has found its outlets all over Europe.

Generally the fillets are packed in parchment paper in packages of 1 kilo for dispatch in wicker baskets.

Methods of Cooling

As a general rule the following programme has been set up for the cooling down of the fillets, which usually are cut out from fish just killed by decapitation:

First Cooling.—Immediately after the cutting out and the rinsing, but before they are packed in parchment paper.

FACTORIES IN DENMARK

Two factories, the first in the country for fish fillet preparation, were erected in Denmark in 1930. Since then, 14 more factories have started. Special Government regulations for the cooling down of the fillets have been enforced and the factories are under severe control. This article briefly traces the growth of this now very fine Danish export product.

Second Cooling.—Immediately after being packed in parchment paper.

Third Cooling.—With ice over and under the packages in the baskets.

The fillets must not be stored in the same refrigerating chambers with untreated fish, and the fillets must not be frozen.

The first cooling is effected either (i) by immersing the freshly cut and well-rinsed fillets for some minutes in a tank with pure water which is kept at a temperature of +1 à +2° C. by means of ice or by a cooling coil. Fig. 2 shows such a tank with external cooling coil. The fillets are thereafter placed for dripping—possibly they may drip off in the packages before these are finally closed, or (ii) in a special cooling chamber which is kept at a temperature of −5 to −8° C., but in which the fillets must not be stored too long to avoid freezing.

Immersion, however, is regarded as the best manner of cooling and is preferred by the Fishery Department.

The second cooling is done in a chamber, the temperature in which is kept as far below 0° C. as possible without risk of freezing the fillets.

Finally, the fillets are packed in baskets or cases lined with wood-flocks, and with crushed ice over and under the packages, and they may now be sent 2 or 3 days' journey away over Europe.

The final packing should take place in a refrigerated room and the packing materials should be pre-cooled in order to save ice.

FIG. 4.—Cooling tank with fish fillets in galvanised wire baskets.

A Modern Fish Fillet Factory

A typical fish fillet factory was built last year in Rønne on the Danish island Bornholm in the Baltic Sea.

The main part of the building (Fig. 3) is used for the fillet factory. In a separate room the head cutting and cleaning of the fish from which the fillets are cut takes place. Another room completely separated from the fish factory is used for handling such fish as are not used for fillets.

After leaving the head-cutting room the fish is rinsed, and when cut out the fillets are rinsed in fresh water, placed in baskets of galvanised wire.

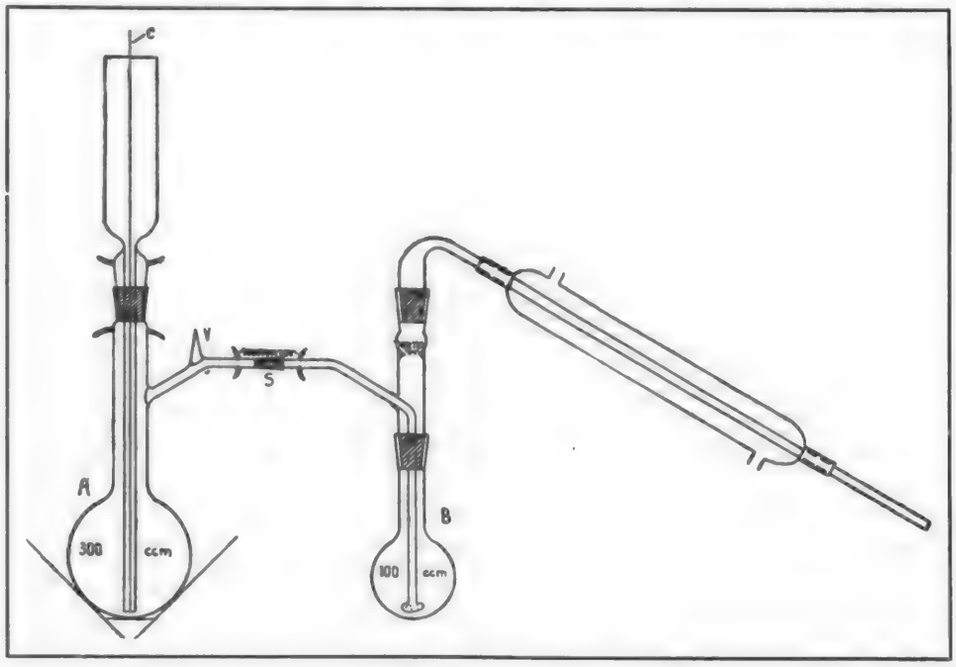
Afterwards the baskets with the fillets are dipped in the cooling tank between the cutting and packing room; packed in parchment paper; and placed in the small refrigerated chamber which is held at temperatures down to −5° C.

Finally, they are packed and stored in the large refrigerated chamber where the temperature is kept as low as 0° C.

(*Continued on page* 388.)

FIG. 5.—Fish fillets in cooling chamber packed in parchment paper. The packages are open one end for dripping off.

NEW METHOD FOR TESTING MEAT SPOILAGE



A NEW method for testing meat, fat and fish for spoilage has been developed in Germany by Drs. Strohecker, Vaubel and Kirchberg. It attempts to overcome the objections which have been raised to previous methods, by making tests on all of the aromatic substances which are given off during a distillation.

The process is carried out on a sample of 10 gm. of meat, finely chopped, and allowed to soak in 10 gm. of double distilled water for half an hour. This is then poured into a flask of 100 c.c. capacity (B, Fig. 1), and 5 c.c. of dialysed iron hydroxide is added. Distillation is carried out by heating the flask over a small flame.

In order to provide sufficient water for the process, additional water is filled into a special flask (A), which is connected to the flask (B) by two tubes themselves connected at (S). The first of these is sealed into the wall of flask A, while the second enters flask B through the side of a filter above the flask and goes down into the bottom of this latter. At the point where the two tubes meet (S) they are carefully sealed and held together with springs fixed to horns projecting from the tubes. Pressure is obtained in the flask (A) by pouring water into it through a funnel (C).

As the mixture in the flask (B) heats, the vapour passes through the filter fixed in its neck and then through a condenser. The distillation is continued until 30 c.c. of distillate have been obtained. The apparatus is then washed out with hot water and then cleaned by being filled with nitric acid.

Tests were made on the distillate, both by titration with permanganate of potassium and in the classical manner by testing for ketones and aldehydes. The permanganate tests were made by adding 10 c.c. of N/10 potassium permanganate solution to 30 c.c. of distillate. (In the case of badly spoiled meats, 20 c.c. of permanganate solution are necessary.) This is boiled together for 10 minutes and 10 c.c of N/10 oxalic acid added. Titration is then carried out by adding more permanganate until the mixture turns red. The degree of spoilage is indicated by the quantity of additional permanganate solution which has to be added to obtain the coloration.

The permanganate solution used is prepared by dissolving 4·4 gr. of $KMnO_4$ in 40 c.c. of concentrated sulphuric acid, and adding water to make one litre. This is boiled for half an hour and then filtered through asbestos.

Fish Fillet Factories in Denmark

(*Continued from preceding page.*)

Refrigerating Machinery

The refrigerating machine is a "Frigore" No. 100, working automatically with methyl chloride as refrigerant.

There are three refrigerated chambers for fish fillets, with grids for direct expansion and two cooling tanks with expansion coils, one for cooling fillets and the other for cooling fish in the special fish-handling room. Thermostatic expansion valves are provided for each refrigerated chamber, whereas the cooling tanks are regulated by hand.

In the large cooling chamber there is a small fan for circulation and renewal of the air.

The whole factory is not very large—being licensed for the production of only 7,500 kilos of fillets per week—but it is a good example of a complete and modern Danish fish fillet factory. (*Abstract from Sabroe News.*)

NOTE.—*The illustrations are of plant supplied by Thos. Ths. Sabroe and Co., Ltd., who built the first and also the latest and most modern ones in Denmark.*

NEWS FROM THE INDUSTRY

Food Explained at Woman's Fair

Visitors at the Woman's Fair, which opens at Olympia on November 2, will have the opportunity of seeing just how their food is made and what ingredients it contains. Many firms such as the following will demonstrate the processes involved in food manufacturing.

A few of the many of the industry's representatives are:

Cadbury Bros., Ltd., whose experts will demonstrate the art of chocolate making and how the centres get in the chocolates. H. J. Green and Co., Ltd., makers of sponge mixtures, jellies, etc. Virol, Ltd., who are exhibiting nerve restorer and tonic foods. Weetabix, Ltd., are exhibiting their special product. A. C. Fincken and Co., manufacturers of "Force" whole wheat flakes, are exhibiting a large selection of their goods. G. Havinden are exhibiting a variety of sweets and jellies in addition to "Rose" brand sweet pickles and olives.

Woman's Fair should capture the enthusiasm of all womenfolk concerned with the home and the feeding of families.

* * *

Universal Distribution of Quick-Frozen Foods

"Mr. Z.", the pseudonym, beloved by the industry's newspapers, of M. T. Zarotschenzeff, pioneer of quick-freezing, once more occupies the headlines. Reason is that "Mr. Z." and his son, Mr. W. M. Zarotschenzeff, have formed a national quick-frozen food distributing organisation. National Frosted Foods, Inc., have their offices at 864, Washington Street, New York.

The new company is intended to bridge the gap between producer and consumer through the use of frosted foods. It will produce, distribute, import and export frosted foods. These consist of a complete line of institutional and retail packages of fish; sea foods, poultry, meats, fruits, vegetables, tropical fruits, fruit juices, etc.

Importing and exporting will be a prominent activity and considerable preliminary survey has been performed. Mr. W. M. Zarotschenzeff's impressions of the Japanese quick-frozen food market were, it will be remembered, given in the September issue of FOOD MANUFACTURE.

Britain's Canned Goods Production Falls While the Empire's Jumps

While the quantity of canned and bottled fruits imported into the United Kingdom last year from Empire countries is the largest so far, there appears to be a decrease in the production of the same goods in England and Wales for that year. These disturbing facts are revealed in the Imperial Economic Committee's annual review, *Supplies of Canned and Dried Fruit*, 1937, published by H.M. Stationery Office on October 20. Here are the facts. The Empire has provided an increasing proportion of the total supplies and in 1937 its contribution totalled 82,000 tons or 45 per cent. of the imports from all sources.

On the other hand, there are no statistics available for 1936 or 1937 regarding home production. Figures for the latter year are, however, being compiled and, "on the whole, there appears to be a slight decrease in the production of all canned and bottled fruits and vegetables in England and Wales in 1937". This conclusion is all the more regrettable because from reports received it appears that heavier crops of certain fruits, particularly plums and damsons, made possible a larger pack in 1936.

A consolation for decreased home production is the knowledge that the Empire countries in 1937 were successful in importing a greater percentage of canned and dried goods, compared with 1936, than foreign countries. The annual total declined from the record figure of 186,000 tons to 183,000 tons and the declared value was just under £6,000,000. Foreign countries also supplied less fruit and fruit pulp, and the total imports of these fruits at under 40,000 tons were the lowest in recent years.

Returning to the Empire it is found that the quantity of canned and bottled fruits imported last year, though somewhat less than in 1935 and 1936, was about 40,000 tons more than the annual average for the period 1929-33 and over 67,000 tons more than for the preceding five years.

The principal Empire sources of supply are Malaya, Australia, Canada and South Africa. Imports of Malayan pineapples into the United Kingdom amounted to 45,000 tons, or approximately the same as the record total of the previous year. This was equivalent to 90 per cent. of the total imports of this variety. Australia is the principal Empire source of the other main varieties, which consist chiefly of peaches, pears and apricots, and in 1937 the imports into the United Kingdom were more than 11,000 tons heavier than in 1936. The production of canned fruits in Canada declined slightly in 1937, but exports to the United Kingdom, which consist principally of apples and pears, reached a new high level.

Shipments from South Africa were on a much reduced scale. This was due chiefly to a big decline in the output in the Union of apricots and pears. Pineapples, peaches and pears are the chief kinds of canned fruit imported, and last year they again accounted for 70 per cent. of the total supplies, with fruit salad, grape fruit, oranges and apricots forming the bulk of the remainder.

The imports of dried fruits in 1937, totalling 169,000 tons, showed a small increase compared with the previous year, but still remained well below the average of earlier post-war years. The value of the imports was £5,500,000. There was a big recovery in the imports of currants from Australia, and also some increase in the Empire supplies of raisins and sultanas, which come both from Australia and from South Africa.

In addition to an exhaustive analysis of the imports of canned and dried fruit and canned vegetables, the survey contains reports on the production in and exports from each of the principal sources of supply.

* * *

New Wheats Safe from Rust

Rust-resistant wheats developed at the Canadian Government Experimental Farms have proved a boon to farmers, and their reputation for rust immunity under field conditions has been definitely established in Canada this year. Rust has seriously damaged all but rust-resistant varieties in some localities of Central Manitoba, states a recent Canadian National Railways crop report. Rain over Southern Saskatchewan has helped the development of rust, which is reported almost as far west as the Alberta boundary.

Canning in Belgium

Food preserving in general is now one of Belgium's leading industries. Vegetable preserving in particular has been carried on for many years and has increased enormously. It has the advantage of a ready supply from market gardeners who have grown side by side with the industry.

Belgian soil is mostly very fertile, but as the country is not large it is split into many smallholdings. Intensive cultivation to get a high monetary return has resulted, and as market gardening is best suited to this form of agriculture it is tending, in some districts, to displace the ordinary crops entirely. Thus the vegetable preserving industry finds a plentiful supply on the spot. Many canning and bottling works are in the environs of Mechlin, Louvain, Antwerp, Brussels and in certain regions in West Flanders owing to the market gardens which cover these areas. Nearly all the work is done by machinery.

These and other facts are contained in a booklet just issued by the Belgian Ministry of Foreign Affairs and Foreign Trade. A valuable list of Belgian manufacturing exporters of preserved foods is a feature worth noting.

* * *

Sanitary Inspectors at Wrexham

Although first arranged for September 30, a Sessional Meeting of the Royal Sanitary Institute did not take place until October 28. The unsettled atmosphere which surrounded the original date prompted postponement. The meeting was arranged in conjunction with the Welsh Branch of the Royal Society of Medical Officers of Health and the North Wales Centre of the Sanitary Inspectors' Association and was held in the Guildhall, Wrexham.

Discussions took place on "Physical Fitness in Relation to Public Health" (opened by Dr. T. P. Edwards, M.O.H., Wrexham) and on "The Food and Drugs Act, 1938" (opened by Mr. D. Thomas, Chief Sanitary Inspector, Wrexham). The chair was taken by Dr. Charles Porter. The papers will be published in the Society's Journal, but are already available from their offices.

* * *

Bacon Contracts

Although Part IV of the Bacon Industry Act became effective on October 1, that part of it which enforces the system of long contract does not come into operation until December 1. The Bacon Development Board to tide over this period have, therefore, decided that until December 1 sales of bacon pigs by registered producers to registered curers and purchases of bacon pigs by registered curers must be made on a grade and dead weight basis. All such pigs must be slaughtered as soon as possible after arrival at the curer's factory, classed according to dead weight and graded according to a schedule of grades laid down by the Board which coincides with the grades to be prescribed for the purpose of the long contract.

Additions and deductions per score must be made according to the grade of the pig, on the following scale: Grade A 6d. per score more than the agreed price; B, the agreed price; C, 6d. per score less than the agreed price; F, 1s. 3d. per score less than the agreed price; L, 9d. per score less than the agreed price; DB, 6d. per score less than the price of the grade in which it would otherwise fall. The curer must also deduct 6d. from the agreed price towards the cost of insuring the pig against the risk of disease or damage in transit. Full details of the grades and weight classes are obtainable from the Board at Neville House, Page Street, London, S.W. 1.

* * *

"Corrected" Milk Beverage

Compelled to reduce the intake of certain foods, owing to illness, the inventor of "Corrected" Milk sought to find substitutes for them. He naturally turned to milk as being one of the most suitable things, but unfortunately found that he could not digest it.

Being an experienced food chemist, he experimented with a view to finding a product which, in the first instance, would be digestible. He tried mixing it with barley water, sodium citrate, water, etc., all to no effect. He experimented with all kinds of edible fats, animal and vegetable, and eventually found one which, when specially treated, could be incorporated with the milk to render it digestible. He found that this combination not only did this, but also doubled the calorific value of the milk. Thus, in the case of an exclusively milk diet, instead of obtaining the daily 3,000 calories from the enormous bulk of 8 pints, only half this fluid is required. This should be of interest to those milk distributors who are anxious to acquaint themselves with the details of "Corrected" Milk, as it is quite as easy to deliver it to daily customers in exactly the same way as they supply ordinary milk.

* * *

Robert Kellie and Son, Ltd., point out that in the October issue we placed them in Aberdeen and while appreciating the honour would like to say that they are still in Dundee.

Compulsory Registration of Fish Traders

Two thousand wholesalers, 8,000 to 16,000 fishmongers and 20,000 to 35,000 fish friers are now required to register themselves with the White Fish Commission. This body, under section 3 of the Sea Fish Industry Act, must compile a register of all persons in Great Britain, excluding Northern Ireland, the Isle of Man and the Channel Islands, dealing in white fish. The necessary forms of application, accompanied by an explanatory note, are being sent direct from the Commission to each member of the various trade associations and to every other fish trader concerned of whose name and address the Commission have information.

Any fish trader who does not receive copies of the forms, etc., should apply direct to the Commission at 6, Old Palace Yard, London, S.W. 1.

* * *

"Victualling Clerks" for Aircraft

Imperial Airways have made another development in their catering system.

The company's services to all parts of the Empire have become so numerous that it is now necessary to appoint what are known as "Victualling Clerks" at certain stations along the routes. They have been selected from stewards who have had years of experience of catering in the air and in addition have a special knowledge of the foodstuffs obtainable in the countries to which they are appointed.

Their duty, as the name implies, is to re-victual the aircraft. They board the plane on arrival, check its stocks of wines, spirits, minerals, beers and foodstuffs, and ensure that it departs with sufficient supplies for the journey to the next control point.

Imperial Airways state that all victualling clerks have been appointed and that no more applications can be considered.

* * *

Changes

The cumbersome name of The London Oil Buyers' Corporation, Ltd., has been shortened by the directors to London Oil Corporation, Ltd. Address remains at 161, Camberwell Grove, London, S.E. 5.

Honeypot Lane, Stanmore, Middlesex, is the new address of the London office and works of the Spiral Tube and Components Co., Ltd. Telephone, Edgware 4658/9; telegrams, Spiratucom, Phone, London.

Mansion House 4750 is the new telephone number of British Soya Products, Ltd., in place of Mansion House 3988.

To identify the Company more closely with the Webster systems of heating and steam specialities, as from November 1 the Atmospheric Steam Heating Co. (1936), Ltd., will be known as Warren Webster and Co., Ltd. Address remains at Commerce Way, Purley Way, Croydon.

* * *

New Publications

A.R.P.-conscious firms will find much information and general interest in the *A B C of A.R.P.*, a booklet which by means of diagrams, plans and pictures shows clearly what precautions can be taken for protection against air attack by high explosive, incendiary and gas bombs. It is published by Jordan and Sons, Ltd., at 6d.

An instrument recently developed as a result of suggestions made by the staff of the Low Temperature Research Station, Cambridge, and now made by the Cambridge Instrument Co., Ltd., is described in a leaflet issued by the latter. It is known as the Cambridge marine storage thermometer and it measures temperature with an accuracy of $\frac{1}{10}$° F.

The rarely realised yet indispensable value of photography to science and industry is expounded in a booklet, *Photography as an Aid to Scientific Work*, issued by Ilford, Ltd. Biological sciences, chemistry and physics each have their own sections.

Described as the latest introduction to improve and simplify industrial lubrication layouts, the Tecalemit "Flex-o-matic" system, which is claimed to enable the quantity of lubricant applied to each bearing to be controlled accurately from one central point, forms the subject of a 12-page leaflet from Tecalemit, Ltd.

A few of the types of centrifugal and propeller fans made by Air Control Installations, Ltd., are summed up in a recent publication, No. F.386. Well illustrated and intensely practical, the leaflet is free to those interested.

The removal of solid matter and of moisture from liquid refrigerants used in food refrigerating installations gives point to a leaflet describing the British Thermostat Co.'s strainers and driers. Another leaflet received from them deals with their pressure-operated water valve.

Booklet from the Graham-Enoch Manufacturing Co., Ltd., deals extensively with their "Gem" Synchro Bottle Washer. It is very well produced, with plenty of good pictures.

Monel Data Book—1 from Henry Wiggin and Co., Ltd., is a *vade mecum* of the metal. Pages 55 to 58 deal exclusively with Monel's application to the food industry. If you ask for the booklet, no charge and no obligation is involved.

Modern steel equipment for factory offices is fully described and illustrated in a large catalogue from Rubery, Owen and Co., Ltd., of Darlaston, South Staffs. It is made with loose leaves so that it can be continually brought up to date as new sheets are issued.

Full magazine size and with a first issue of 16 pages, an ambitious house journal, the *Masseeley Users' Magazine*, has been recently issued. Although frankly stating its purpose as a publication designed "to advance the technique of Advertising at the point of sale by the Masseeley system", it loses nothing by this avowal. Rather with a full knowledge that it is intended as prestige advertising, one cannot help but praise this production. Masseeley machine user or not there is something of interest to every manufacturer in this journal.

BUYERS' GUIDE

Modern Food Flavours

Inventors of vanillin, Haarman and Reimer of Holzminden, Germany, have issued a comprehensive price list of their modern food flavours. Sectionalised, it deals specifically with flavours for different purposes facilitating easy reference.

The firm's English representatives, T. Harrison and Co., of Willesden, issue a leaflet dealing with a new flavour, "Van-B-ness" which they are manufacturing on the German firm's behalf for the home market. It is claimed to be a perfect substitute for vanilla beans which contain, in addition to vanillin (the main bearer of their aroma), many other constituents which create their fruity and characteristic taste. In "Van-B-ness" these by-products are combined with vanillin in the same proportions as the natural fruit.

* * *

New Dairy Machinery

Stand of the Aluminium Plant and Vessel Co., Ltd., at the B.D.F.A. Show, exhibited four novel machines. The "Combined" machine includes in one frame milk heating, cooling and filtering elements as well as calorifier and hot water circulator. Next, the "Tarbet" positive holder reappears in a new guise, better in appearance, more robustly constructed and with all-electric operation. Third is part of a milk evaporating unit fabricated in stainless steel. This, only a part of the complete unit, rises 20 ft. from the floor. Last comes an all-metal butter churn which has had a good reception abroad. It will be interesting to learn the views of English butter makers on this new development which already has had wide application.

* * *

The "Destron" split pulley for food machinery drives.

Food manufacturers interested in drives for their machinery will find a new split pulley known as the "Destron" worthy of note. They are made with interchangeable bushes so that they may be fitted to any required size of shaft, are inherently well-balanced, are machined to a high degree of accuracy and are made from steel plate of heavy section, welded together to make an extremely rigid, tough, light structure. Douglas Lawson and Co., Ltd., make this patent pulley.

Turbine Screen Sifter

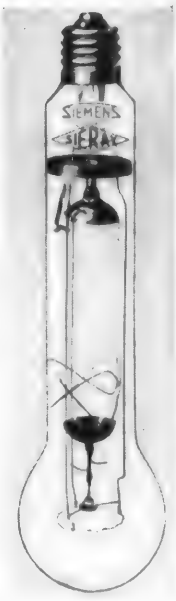
The "Pascall" patent turbine screen sifters, capable of large output and made in four sizes, are not confined to the sifting of flour, but are suitable for many other branches of industry, and have achieved results hitherto considered impossible. The material worked being completely atomised with an "air-blown" fineness, any desired output and reasonable fineness is obtainable.

The screens are quickly changeable, and two dust-tight doors provide easy access and facilitate cleaning. There are no brushes incorporated in the construction and moderately sticky or damp products do not clog the sifter, which works on a very low power consumption.

The sifter occupies a small space and is practically self-working. The smaller sizes have been used in large numbers by up-to-date chemical, cosmetic and colour and dyestuff manufacturers and have proved most efficient for their purposes.

Improvements

Below is shown the "Pascall" turbine mixer, and right is the new Siemens lamp, both described on this page.



The "Pascall" sifter and other machines can be inspected and manufacturer's own materials can be tested without obligation at the makers' Central London Testing Station.

* * *

Towards Better Lighting

That part of the new Factories Act which deals with lighting arrangements says that they must be "sufficient and suitable". Prompted, possibly, by this, Siemens Electric Lamps and Supplies, Ltd., have produced a combination of the mercury-vapour discharge lamp with the incandescent tungsten filament by which the familiar colour difficulty of the unmodified mercury-vapour source is eliminated. 33⅓ per cent. more light than that given by a 300 watt gas-filled lamp is claimed for these 300 watt "Seiray-Dual" lamps. 500 watt gives 50 per cent. more than a gas-filled lamp of corresponding wattage.

TWO ELECTRIC OVENS

Travelling Ovens

An electric travelling baking oven which was specially designed for small cakes, chocolate bricks and other confections, and is capable of baking as much as 850 lbs. of of cake per hour, is an interesting example of its type and is installed in a well-known bakery firm. Its overall dimensions are 41 ft. long by 8 ft. 6 ins. wide, and its internal measurements 35 ft. by 6 ft. 2 ins.

The oven is doublecased throughout, and expansion joints are provided on the inner case at frequent intervals; the whole of the inner case is suspended from a framework to minimise heat losses (Patent No. 288,785/27). The space between the cases is lagged with heat-insulating material to a thickness of 12 ins. at the top and sides and 10 ins. at the bottom. Above and below the conveyor chain are mounted heating elements of the tubular steamtight type, which have proved their reliability in thousands of similar baking oven installations.

The total loading of the oven is 200 kw., which is divided into eight separate banks, each balanced across the 400/230 volts 3-phase four-wire a.c. supply. In normal operation each bank is automatically controlled according to the temperature. Push-button switches are also provided to allow of any bank being isolated when required; for instance, an element can be replaced if necessary without interfering with the baking.

The control gear, which is arranged above the conveyor, consists of mercury-in-steel indicating controllers. The necessary contactors and switchgear are placed centrally on a control board above the oven, and red and green lamps indicate which banks of elements are on circuit. Inspection lights and doors are arranged at three points along the oven length. The doors at each end of the oven are of the rise-and-fall type and are fitted with counterbalance weights that ensure easy and positive action.

The oven is designed to accommodate two 30 by 18½-inch trays abreast. The trays are carried through the oven on a camel-back conveyor chain, which passes through the oven and returns underneath at a speed that can be varied to take from 5 to 120 minutes from end to end of the oven. The conveyor is driven by a 2 h.p. 1,455 r.p.m. G.E.C. squirrel cage induction motor through 24 : 1 reduction gearing and a P.I.V. gear unit.

It will be seen that this design of travelling baking oven has great advantages in its extreme compactness in relation to its capacity and also in the efficiency of the oven insulation, which permits the driving mechanism and main control switchgear to be mounted direct on top of the outer case, thus economising space.

Peel Ovens

Three peel ovens, which are used for Genoa, Dundee and other cake baking, are standard double-deck sack size units with overall dimensions 6 ft. high, 6 ft. 1 in. wide and 9 ft. 8 ins. deep, and internal dimensions per deck 1 ft. high, 4 ft. wide and 8 ft. deep. The soles are tiled, and the interiors are constructed from sheet steel and finished in vitro-enamel, preventing the possibility of corrosion during baking. The loading is 36 kw. (18 kw. per deck), and the ovens will attain a temperature of 500° F. from dead cold in about half an hour with all switches in the high position.

LIGHTING FOR FOOD FACTORIES

Good and adequate illumination is now not merely a matter of opinion but a question of obeying the law. Section S.5. of the new Factories Act requires that, "Sufficient and suitable lighting, whether by natural or artificial means, must be maintained in all parts of the factory whether persons are working or only passing there."

This topical article propounds the particular lighting requirements of the food industry, gives suggestions and comparisons.

W. ROBINSON, B.Sc.
E.L.M.A. Lighting Service Bureau.

THE PARTICULAR requirements of lighting for the manufacturers of food products are as follows:

1. There should be sufficient light for the seeing task.
2. There should be no glare.
3. There should be no possibility of broken lamps or glassware falling into food receptacles.
4. The lighting equipment should be easily accessible for cleaning and should not detract from the general cleanliness of the premises.

Discussing these factors in very general terms the first question to be considered is that of intensity of illumination. The following values of illumination will serve as a guide to the requirements of premises where special problems do not arise, but it should be remembered that definite recommendations cannot be laid down without a thorough analysis of all the factors involved to determine the severity of the visual task.

	Average Foot-Candles Recommended.	*Range.*
Bakery	8	6-10
Dairy products	8	6-10
Flour milling	8	6-10
Flour grading	20	15-25
Packing: Crating	5	4-6
Boxing	8	6-10
Sugar grading	20	15-25
Sweet making	12	10-15

Due attention should be paid to the elimination of glare and the evenness of illumination. The spacing/mounting height ratio recommended by the manufacturers for lighting fittings should not be exceeded, and in all possible cases the lighting should be general in character—*i.e.*, it should be uniform over the whole working area.

Even though the chances may appear remote, it is important to guard against broken lamp parts falling into food vats. A wise precaution is to use what is known as the Industrial Diffusing Reflector, which has a diffusing bowl surrounding the lamp. The fitting gives well-diffused, glareless light, and allows a proportion of the light to reach the ceiling, giving a more spacious and cheerful air to the factory. Alternatively, glass vizors may be used with the Standard Dispersive type reflector.

Indirect Lighting

A method that is being found to have advantages which outweigh the additional current costs is that of totally indirect lighting. In one large factory this has been achieved by directing small floodlight type, vizored reflectors on to the ceilings or upper parts of the walls. It has been found possible to place the fittings without regard to the positions of machinery or workers, and hence to obtain absolutely uniform, glare-free lighting which not only fulfils all the requirements previously mentioned but considerably enhances the appearance of the whole factory, an important consideration, since the plant is freely shown to the outside public and is regarded as a major advertisement for its products. It is also found that maintenance is reduced to a minimum, since all fittings are easily accessible by ladder, and, finally, dark spots have been eliminated so that it is impossible for dirt to remain undetected.

In urging the greater adoption of indirect lighting in food factories, flour mills, dairies and similar industries, the writer is well aware that the principle is something of a breakaway from traditional practice. Experience, however, has proved that this type of lighting is economically justifiable, as well as being desirable, on the above grounds, and those considering the lighting of their premises would do well to consider and investigate the practicability of indirect lighting before finally settling on a scheme. It is interesting to note that the average cost of lighting to-day is one-fifth of the lighting cost in 1921 using gasfilled lamps, and only one-fifteenth if electric discharge lamps are used.

Increase in Production

Practical tests in other industries have shown conclusively that higher levels of illumination increase production. In some cases, particularly in textiles, the output under artificial illumination has exceeded that under daylight due to the superior light control of the artificial system. The table below summarises some of the more important production tests carried out during the last few years.

INCREASED PRODUCTION GAINED BY GOOD LIGHTING.

Shop.	*Average Foot-Candles with Old System.* (*Per Cent.*)	*Average Foot-Candles with New System.* (*Per Cent.*)	*Increase in Production with New System.* (*Per Cent.*)
Foundry ...	2·5	7·0	7·5
Tile pressing ...	0·59	14·3	12·8
Typesetting (by hand) ...	1·3	20·0	24·0
Jute weaving ...	9·8	21·4	13·2
Silk weaving ...	50·0	100·0	21·0
Wool knitting	5·0	50·0	20·0
Roller bearing	5·0	20·0	12·5

Improved Quality

Better lighting conditions also result in an improved quality of manufacture. Faults are detected in the initial stages of production, and this results in a considerable monetary saving to the factory proprietor. A report issued by H.M. Inspector of Factories cited a case where an operative was expected to work to one ten-thousandth of an inch under quite inadequate illumination, the direct loss resulting from spoiling one piece of material being approximately £200. For precision work efficient lighting must be provided, otherwise, even though good tools and workers are available, their efforts are nullified.

INFORMATION and ADVICE

Bacon Curing — Meat Extract Plant — Candied Lemon Peel — Tomato Juice — Synthetic Essence

Bacon Curing

4,299. *Could you give us information on the drying of bacon? We want temperatures and we want to know the volume of air necessary to pass through the drying room, the size of room, the length of time the bacon should stay in it, and what effect, if any, the volume of air has on bacon. Any information on the curing of bacon, particularly drying, would be appreciated.* (New Zealand.)

You are propounding questions on the subject of an industry which involves very highly skilled collaboration, and although much information can be obtained from books and articles, unless you are already acquainted with the main principles of the subject, it would require more space than is available in this section.

We are sending you a copy of Food Investigation Leaflet No. 5, which deals with bacon curing, and we feel sure that this will be of great help to you.

Meat Extract Plant

4,359. *Perhaps you may have produced articles dealing with meat extract plants in some form or other. We are engaged on the design and preparation of drawings and estimates for a client of ours, and while we have some useful and reliable data on which to work, we want to extend our knowledge with some experience that you may be able to put forward.* (Burton-on-Trent.)

We published in FOOD MANUFACTURE of August, 1930, some notes on commercial production of extract of meat, and a copy of this issue is available.

The matter of the design of extract of meat plant depends so much upon the particular proposition to be tackled that we should suggest you get into touch with an expert on the subject.

Candied Lemon Peel

4,297. *I want to make my own candied lemon peel for mincemeat and should be glad of help on the subject. The plant available consists of high-pressure steam, copper boiling pans and a gas-heated drying cupboard.* (Derby.)

Lemon skins usually come packed in pipes or hogsheads preserved in a 60° salt brine. When they are to be used, open and run off the brine and flush with water. Transfer to a kettle and again flush with water that has been heated to about 100° F. Drain and flush five times at hourly intervals.

The soaked skins are well drained upon removal from the soaking tank and carefully packed or capped one inside the other all around the vessel or tub until it is half full. Make a 10° Bé. (18° Brix) syrup, and pour over the skins and use a rack or screen to keep them immersed. After 24 hours, run off this syrup and build it up to 10° Bé., to be used on the next batch of skins.

Make a fresh 20° Bé. or 37° Brix syrup and again cover for 24 hours, drain and add sugar to build the syrup to 24° Bé. or 44° Brix, and cover for 2 days more. Drain again and build the syrup up to 28° Bé. (52° Brix), and again cover and allow them to remain in the syrup until ready to be used.

All syrup must be added boiling hot. The reason the 10° Bé. is added first to leach out any salt, replacing it with the weak sugar solution. A heavier syrup at the start would rapidly fill the pores near the surface and not permit the proper absorption of the sugar to the interior and spoilage would result.

When ready to use, take the peel out of the syrup and place face down on wire trays for 12 hours to drain, and place these trays on racks in the drying room from 6 to 12 hours at 110° to 120° F. The skins can be cut into squares or strips and packed in wax cartons or in kegs or casks. (*Campbell's Book.*)

Tomato Juice—Synthetic Essence

4,304. *Please advise us the supplier of "Fixoid". Also the maker of "Ferbo B" butter flavour, and names of firms manufacturing machines for the extraction of tomato juice and other by-products. We would appreciate a formula to make synthetic raspberry essence and the name of the best fixative for synthetic raspberry essence and other synthetic essences such as strawberry, banana, pineapple, cherry, apricot, port wine. The essences are wanted for use in jelly crystals, cordial crystals, ice-cream, custard and pudding powders. We want to buy the latest book published on the manufacture of foodstuffs—what we call grocer's sundries. These include such lines as shoe cleaner, flavouring, essences, ice-cream powders, junket crystals, cloudy ammonia, Parisian essence, etc. Our trouble with Parisian essence has been when we make the caramel by our crude method it goes hard when cold, and if we add more water to keep it soft the Parisian essence is not strong enough—that is, the tinctorial strength is too weak.* (Australia.)

Our notices in the "Information Required" column of our journal asking for the names of suppliers of "Fixoid" and "Ferbo B" have so far failed to elicit replies from our readers. In the event of these names and addresses being given to us, we will forward same to you. Firms manufacturing machines for the extraction of tomato juice were given, and suitable books were recommended.

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NEW COMPANIES

Boyd's Creameries, Ltd. (344550.) September 23. Milk producers, dlrs. in cream, etc. £5,000. Permt. dirs.: A. R. Jackson, Rocklands, Bolton Hill, Wilmslow; C. B. Jackson, Casanova, Scarsdale Road, Victoria Park, Manchester.

Branwheata, Ltd. (344423.) September 19. Eagle Works, Tame Street, Stalybridge. To take over the bus. of mnfrs. of and dlrs. in "Branwheata"; to adopt agreements for the acquisition of a secret process and formula and the assets and liabilities connected therewith; and to carry on the bus. of mnfrs. of and dlrs. in flour, bread, etc. £6,000. Dirs.: C. W. Barnes, Fairview, Harvey Road, Guildford, Surrey; J. P. Hodgson, Richmond House, Mottram Road, Stalybridge; McPherson, 57, Couldray Road, Southport; O. L. Spedding, Parkhill, Millbrook, Stalybridge.

British Scandia Products, Ltd. (344203.) September 10. Importers, exporters, mnfrs., wholesalers and retailers of foodstuffs, canned goods, etc., 50, Nevern Square, S.W. 5. £2,000. Dirs.: D. P. Lund, Balfour House, London, E.C. 2; O. A. C. Von Myhre and V. A. Loftus-Paton.

Caterers' Buying Association, Ltd. (344624.) September 26. 13, Northumberland Alley, E.C. 3. Mnfrs. and importers of and dlrs. in foodstuffs of all kinds. £15,125. Dirs.: D. J. Negroponte, R. A. Snell, Whiteness Hotel, 45-7, Queen's Gardens, London, W. 2; T. Soutzos, 119, Chalkhill Road, Wembley; N. Tambakis.

F. and H. (Products), Ltd. (344517.) September 22. Moores Square, Landport, Portsmouth. Producers, mnfrs. of and dlrs. in sauces, spices, pickles, etc. £2,000. Dirs.: S. A. Fogarty, Moores Square, Landport, Portsmouth; F. W. Hall, 13, Oriel Road, North End, Portsmouth.

S. B. Lowman and Sons, Ltd. (344571.) September 23. 78, Portswood Road, Southampton. Bakers, confectioners, and catering contractors. £62,500. Dirs.: H. G. Lowman, Edith E. Lowman, and O. N. Lowman, all of 78, The Avenue, Southampton; H. K. Lowman, Cranford, Ashurst Bridge, Totton, Hants; D. B. Lowman, The Willows, Oaklands Way, Bassett, Southampton.

Orchard Confectionery, Ltd. (344185.) September 9. To take over the bus. cd. on at Blackheath, Staffs, as the Orchard Confectionery Co. £4,000. Dirs.: E. Willetts, jnr., 19, Highfields Crescent, Blackheath, Staffs; B. Willetts, 18, Highfields Crescent, Blackheath, Staffs; S. Willetts, J. Willetts and J. K. Willetts.

Patisserie Anglaise, Ltd. (344732.) September 28. 1, Chester Road, Whitby, Wirral. Bakers and confectioners. £1,000. Dirs.: H. W. Boultbee, J.P., Godrevy, Whitby; Lt.-Comdr. P. C. Deverell, R.N., 8, Kingsmead Estate, Upton, near Chester; J. Hughes, 28, St. Martin's Fields, Chester; C. G. Northam, The Limes, Neston Road, Burton, Wirral; H. Owen, 68, Church Road, Bebington, Wirral; W. Jones, Ivanhoe, Holywell Road, Flint.

Robin's Farm Produce, Ltd. (344012.) September 3. 98, East Street, Walworth Road, S.E. Grocers, provision and poultry retailers, etc. £1,000. Dirs.: A. Robin and D. Robin, 74, Hodford Road, Golder's Green, N.W. 11.

F. H. G. Rogers, Ltd. (343954.) September 2. Broadmead House, 21, Panton Street, S.W. 1. Caterers, proprietors of milk bars, etc. Life dirs.: F. H. G. Rogers and Mrs. S. M. Rogers, 21, Blairderry Road, S.W. 2.

Seincar, Ltd. (344266.) September 12. 45, St. Paul's Street, Leeds. Dairymen, etc. £3,000. Dirs.: J. A. Button, 18, Willow Street, Barnsley; E. C. Waller, 2, Meadow View Road, Meadowhead, Sheffield, 8.

Standa Products (Blackpool), Ltd. (343631.) August 22. 61, Cookson Street, Blackpool. To take over the bus. of cream retailers and dlrs. cd. on at 32, Lune Grove, Blackpool, as Standa Products. £1,500. Dirs.: Miss E. A. Loines, 222, Stockport Road, Cheadle Heath, Stockport; T. H. Bolshaw, 38a, The Square, St. Annes-on-Sea, Lytham St. Annes.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

TRADE MARKS

BROOKES.—B 579,036. **Bread, cakes and biscuits for sale within a radius of fifty miles of the Manchester Town Hall.** W. J. Brookes and Sons, Ltd., Skerton Road, Old Trafford, Manchester, 16. (Associated.) October 5.

CALEXOL.—600,295. **Biscuits not being food for animals.** Allan William Alexander, Dunalister, Wheatfield Road, Ayr. September 28.

DAY-BY-DAY.—585,560. **Biscuits.** Peek, Frean and Co., Ltd., 158, Drummond Road, Bermondsey, London, S.E. 16. September 28.

Advertised before acceptance. Section 18 (1) (proviso).

DIFEMAX.—600,312. **All goods in Class 5, which includes children's and invalids' foods.** United Proprietaries, Ltd., 6, New Street, Guernsey, Channel Islands. (Associated.) October 5.

DUESELIX. — 600,590. **All goods in Class 5, which includes children's and invalids' foods.** The British Drug Houses, Ltd., 16 to 32, Graham Street, City Road, London, N. 1. October 5.

HOMOSE.—586,193. **Substances used as food or as ingredients in food.** Harvo, Ltd., 257, Lawley Street, Birmingham. (Associated.) September 21.

KELPIE. — 586,687. **Potato crisps and articles of food made in imitation of potato crisps.** D. Ellis and Co., Ltd., Bideford Avenue, Perivale, Middlesex. September 21.

LACTOKRAFT.—586,641. **Milk products for food.** Kraft Cheese Co., Ltd., Silverdale Road, Hayes, Middlesex. (Associated.) September 21.

LEMZES.—587,101. **Substances used as food or as ingredients in food.** The Scottish Flavour and Colour Co., Ltd., 27, Ratcliffe Terrace, Edinburgh. September 21.

LUVITA.—600,118. **All goods in Class 30, which includes coffee, tea, cocoa, sugar, rice, tapioca, sago, coffee substitutes; flour, and preparations made from cereals; bread, biscuits, cakes, pastry and confectionery, ices; honey, treacle, baking powder, yeast, salt, mustard, pepper, vinegar, sauces, spices, etc.** The English and Scottish Joint Co-operative Wholesale Society, Ltd., 100, Leman Street, London, E. 1. September 28.

NED LOH. — 585,394. **Lard for food.** R. W. Holden, Ltd., Primrose Factory, Ratcliffe Street, Darwen, Lancashire. (By Consent.) September 28.

Registration of this trade mark shall give no right to the exclusive use of the word "Banquet".

OVEN GLORY.—586,709. **Flour.** John Greenwood and Sons, Ltd., Elevator Road, Trafford Park, Manchester. September 21.

PROVEC.—586,792. **Egg substitutes for use as ingredients in food.** British Fondants, Ltd., Avern Works, Avern Road, East Molesey, Surrey. September 21.

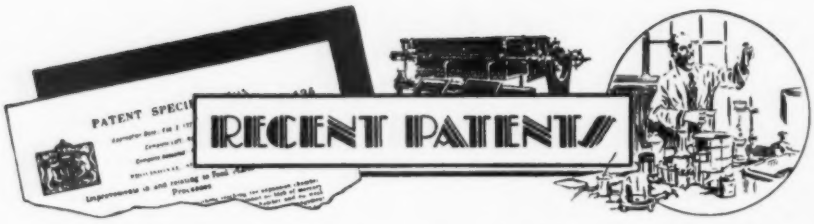
RED CHIEF.—584,419. **Canned salmon.** George Richard Cole, trading as G. R. Cole and Co., 37, Mincing Lane, London, E.C. 3. September 28.

User claimed from June, 1931. Section 12 (2).

WILLIAMSTON MOUNTAIN.—583,719. **Potatoes (for food) grown on Williamston Mountain in Pembrokeshire.** The Richard England Farming Co., Ltd., West Dock, Cardiff. June 22.

ZELAN. — 586,611. **Substances used as food or as ingredients in food.** Harry Glanville Pigott, trading as H. Pigott and Son, 104 and 105, Friar Street, Reading. (By Consent.) September 14.

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).



Latest Patent Applications

25681. McNeil and Co., Ltd., J., and Younger, T.: Dumbturners for sugar mills. September 2.
25753. Schou, H.: Manufacture of chocolate, etc. September 2.
25791. Graham, M.: Manufacture of products containing fats. September 3.
25916. Ellis, A. H.: Machine for loading, etc., sausage skins. September 5.
26233. Cholodny, D.: Beverages. September 8.
26264. Brown, F.: Machines for extracting juice from vegetable matter. September 8.
26701. Rottinger, A. C.: Manufacture of dried vegetable products. September 13.
26747. Short Milling Co., J. R.: Cereal products, etc. September 13.
26788. Hommel, G. W.: Treatment of foodstuffs. September 14.
27125. Procter and Gamble Co.: Whipped creams, etc. September 16.
27517. Musher, A.: Thickened, etc., foodstuffs. September 21.

Complete Specifications Accepted

491,787. Janes, G.: Milk-sampling equipment.
492,049. Halton, P., and Fisher, E. A.: Determining the baking qualities of wheaten flour dough and apparatus therefor.
492,255. Ramesohl and Schmidt Akt.-Ges.: Clarification of molasses.
492,582. Aktiebolaget Separator: Method for the extraction of solid matters from liquids obtained in pressing animal products. (Cognate applications 2046/38 and 2047/38.)
492,608. Ruzicka, C., and Sale, C. V., and Sale, G. S. (trading as Sale and Co.): Waterproofing of wrapping papers.
492,612. Nevanas, S. V.: Preservation and storage of perishable foodstuffs.
492,714. British Association of Research for Cocoa, Chocolate, Sugar, Confectionery, and Jam Trades, Macara, T., Stainsby, W. J., and Campbell, L. E.: Preservation of organic materials, particularly oils and fats, and bodies containing same.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

484,749. **Food preparations.** Klotz, A.
An active dry preparation of papain or similar vegetable protease is obtained by mixing it with a mixture of dry yeast containing emulsin, and seed containing amygdalin or with seed containing both amygdalin and emulsin. Liberation of hydrogen cyanide and subsequent activation occur only when the preparation is moistened. The seed is de-husked, de-oiled, and pulverised before admixture. Suitable seeds are plum, apricot, peach, almond, cherry, apple, quince, red currant, poppy, lucerne, lentil, lupin, ricinus, cocoa, soya, olive, pumpkin, oat, barley, and germinant corn. In an example, 50 parts by weight papain, 30 parts yeast, and 20 parts cocoa seed are admixed.

484,791. **Food preparations.** Baron, R.
In making a food product according to the process described in the parent specification a flavouring is added during or subsequent to the mixing operation. The flavouring materials used include celery, tomato, parsley, mint, sage, thyme, mace, marjoram, cinnamon, clove, nutmeg, ginger, curry, piccalilli, coffee, chicory, cocoa, chocolate, lemon, orange, pine-apple, peach, apricot, apple, pear, cherry, plum, prune, greengage, damson, grape, grapefruit, banana, raspberry, strawberry, gooseberry, black currant, red currant, blackberry, loganberry, almond, walnut, coconut, aniseed, vanilla, lime-juice, peppermint, liquorice, rum, brandy, gin, port wine and sherry.

484,990. **Coating compositions for paper, etc., cartons, etc.** Lacour, G.
A paper, etc., carton, etc., for milk, vinegar, etc., is provided, at least internally, by dipping, etc., with a coating of latex or rubber milk, natural or artificial, containing a tannic substance, such as a tannic extract of a vegetable nature—*e.g.*, catechu. The coating material is preferably produced by (*a*) making an emulsion of paraffin, using gum arabic, at a temperature close to the melting point of the wax, and then rapidly cooling; (*b*) preparing an aqueous solution of gum tragacanth of 2 to 3 per cent. strength, then mixing the emulsion (*a*) with the solution, (*b*), and finally (*a*), mixing the product (*c*) with latex containing tannin. Latex is further added to the product (*d*) in order to obtain a paraffin content of from 2 to 10 per cent. with reference to the dry latex, while the tannin content may be from a few thousandths to a few ten-thousandths per cent.

485,722. **Cooking food; tea and coffee preparations.** Clayton, C. E. Every-(Hydro-Groeck-Ges.).
To ensure that the natural hardness of water, which is to be used in the preparation of food or beverages, is retained when it is heated, sodium bisulphate or other alkali bisulphate is added to the water or to the material under treatment. It may be used in tablet form. When the water is deficient in lime and magnesia, calcium carbonate with or without magnesium carbonate is mixed with the salt. As sodium bisulphate is hygroscopic, a neutral soluble non-hygroscopic salt or salts may be incorporated with it. Anhydrous sodium, magnesium or ammonium sulphate or corresponding nitrates or phosphates are suitable for this purpose.

486,032. **Preserving food.** Hildisch, D.
The process described in the parent specification is modified by adding a small quantity—*e.g.*, about 2 to 10 per cent. by weight—of an emulsified oil of animal or vegetable origin or of egg yolk to the glycerine or glycerine-salt solution. Oils contained in the material treated—*e.g.*, whale or herring oils—are particularly suitable. Milk, casein and gelatine may also be added. The process may be used for the preservation of materials from which fish fillets, split fish, stock fish and smoked fish are prepared, and also for other flesh containing fish oil—*e.g.*, crabs, which may be preserved in raw or boiled form, and the flesh of seabirds, which may be skinned, kept for a time in the glycerine salt solution and then, if desired, dried. The preserved materials may be used as a food for animals in fox farms, etc.

486,054. **Vitamins.** Lily and Co., E., Rhodehamel, H. W., and Kleiderer, E. C.
Stable solutions of one or more vitamins of the B group are made in a polyhydric alcohol containing three carbon atoms, all of which occur in an aliphatic carbon-to-carbon chain. Suitable alcohols are propylene glycol and glycerin. Vitamin B_1 may be used in the form of crystals of the hydrochloride.

486,055. **Vitamins.** Lily and Co., E., Rhodehamel, H. W., and Kleiderer, E. C.
A stable preparation of vitamin C is prepared by dissolving the vitamin or a substance containing it in a propane diol, preferably 1·2 propane diol.

486,463. **Making emulsions.** Preiser, H.
Fruit jellies or other pectin-containing jellies are forced through a homogenising apparatus, preferably after reduction to small particles, to form stable liquid products. These products may be spread like honey, or diluted to form a fruit drink, or may be used as emulsifying agents—*e.g.*, for emulsifying oil in water in making medicinal, cosmetic or food products. An emulsifying agent may comprise 2 to 5 parts by weight of pectin, 0·5 to 1·5 parts of agar, 0 to 1 part of gelatine and 0 to 5 parts of gum arabic, the whole being dissolved in 100 parts of hot water, set, and homogenised to form a liquid.

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